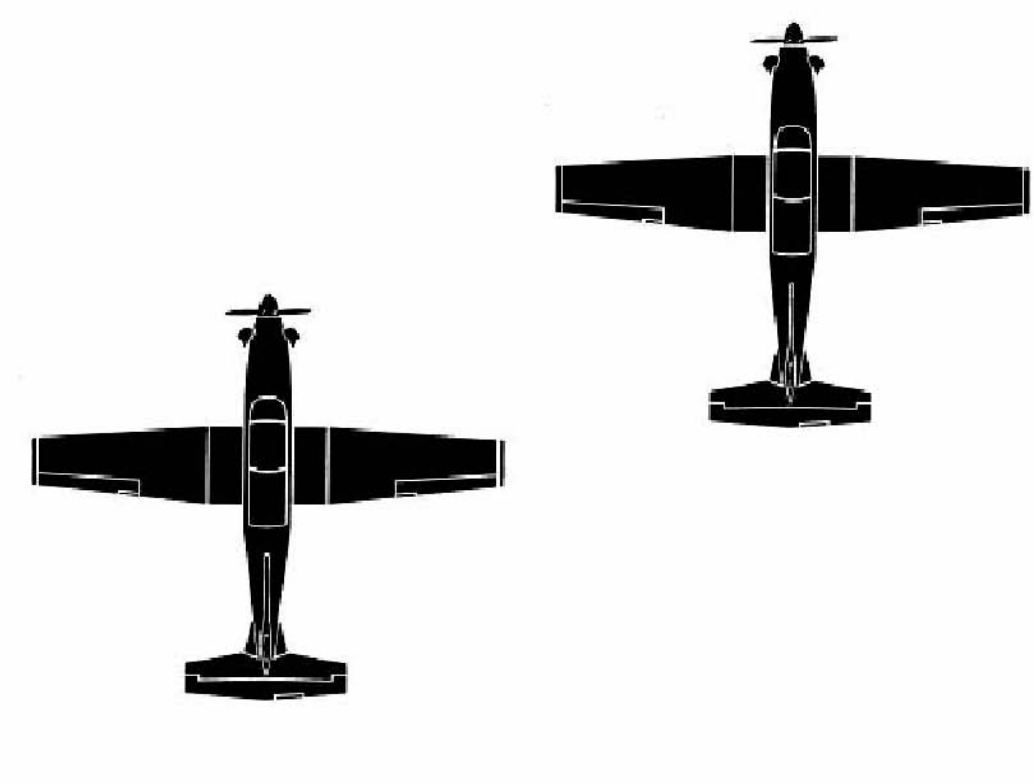
41 FTS EP Guide

1 Jan 2011



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SUMMARY OF CHANGES

To submit changes, contact the 41st Check flight.

Date	Page(s) effected	Description
11 Feb 11	4	Added Summary of Changes

EMERGENCY PROCEDURES MATRIX

Updated: 1 Jan 11	Emergency	TCCC	ELP	Straight-In	Ground Egress	Shut Down Rwy	Taxi Clear	Taxi Back
HYDRAULICS								
Low Emgcy Hyd Press	X			X				X
Low Main Hyd Fluid	X			X		X		
ELECTRICAL (Note1)								
Gen Failure	X					X		
Gen Bus Failure	X						X	
Bat Bus Failure	X						X	
Bus Tie Failure	X							X
Gen and Bat Failure	X					X		
Total Electrical Failure	X					X		
Electrical Fire	X				X	X		
FUEL								
Low Fuel Pressure	X	X	X				X	
Imbalance	X			X				X
Leak	X			X (5)	X	X		
Fuel Probe Malfunction				X				X
OXYGEN								
Smoke/fumes	X			X	X	X		
OBOGS Failure	X (6)							X (7)
OBOGS Overtemp	X (6)							X (7)
ENGINE								
Fire	X	X	X		X	X		
Overheat	X	X	X		X	X		
Failure	X	X	X			X		
Uncommanded Power Changes/Loss of Power/Uncommanded Prop Feather	X	X	X			X		
Oil System Malfunction	X	X	X			X		
CHIP Light	X	X	X			X		
Compress	X	X	X			X		

or Stall								
LANDING GEAR								
Unsafe Indications	X			X		X		
Emergency Extension	X			X				
Gear Over-speed	X (2)			X				X
Blown Tire	X			X		X		
MISCELLANEOUS								
Flap Failure/Asymmetric	X			X				X
Flap Over-speed	X (2)			X				X
Over-G	X (2)			X				X
Trim Malfunction	X			X				X
Flight Control	X			X			X	
Physiological Incident	X			X			X	
PMU Failure	X (3)	X (3)	X (3)					X
Canopy unlocked	X		X (4)	X				X
Loss of Cockpit Press.	X			X				X (7)

See next page for notes.

The information shown in the above table is what the SOF is expecting T-6 aircrews to do with the given emergencies. Aircrews are encouraged to take this table into consideration when handling an EP, but aircrew judgment will always take precedence.

EP Matrix Notes:

(1) Execute electrical failure pattern as required (IFG/FIH)
(2) If severe (apparent damage, aircraft not handling normally, or grossly above limits), declare an emergency. IP on board can make determination of "slight" overspeeds/over-Gs and return early instead of declaring. Solo students should declare an emergency and consult the SOF for assistance.
(3) Execute a Turn-Climb-Clean-Check and an ELP for PMU failure with uncommanded power changes, then shut down on runway.
(4) If canopy malfunction affects ability to safely eject, stay on profile for a suitable runway and perform an ELP
(5) If leak is great enough to lead to engine failure, execute Turn-Climb-Clean-Check and ELP.
(6) If flight conditions to not require the use of supplemental oxygen, an emergency need not be declared.
(7) If emergency led to a physiological incident, taxi clear of the runway and wait for a Flight Surgeon. Otherwise, return to parking.

PURPOSE

The purpose of this guide is to establish a standardized, comprehensive reference source from which to instruct and discuss the myriad of possible T-6 Emergency Procedures. It will be updated periodically to incorporate any new data – please submit any proposed changes to 41 FTS/DOT.

This guide is not intended to be used in place of the source documents that were used in its development but rather in conjunction with them. When studying specific Emergency Procedures, as a minimum, reference the Checklist as it will be the primary in-flight source to deal with any system degradation or failure.

The following source documents were used to develop this guide:

TO 1T-6A-1 TO 1T-6A-1CL-1 AFMAN 11-248 14 FTW T-6 In-Flight Guide

EMERGENCY PROCEDURES BASICS

The following provides guidance for students and IPs in any stand-up EP scenario. As with any emergency, different situations may require action that is not specifically outlined in this guidance. As always, these procedures should not be substituted for sound pilot judgment.

Emergency Procedures Setup Rules Of Engagement

Setting up an EP poorly can cause confusion and result in substandard student performance. To standardize EP setup IPs will normally begin the situation with either a perceived loss of thrust or unusual aircraft performance followed by any appropriate aural tones (or with only aural tones if appropriate). The set-up will largely determine the initial actions of the EP pilot, so be sure to give indications suitable to the response you are expecting.

Performing the Stand-Up Emergency Procedure

"Sir, may I ask some set-up questions?" The pilot receiving the EP, upon being selected, should ask any questions he/she has regarding the details of the scenario. These should not be confused with the actual analysis to be completed after maintain aircraft control. Examples of set-up questions include but are not limited to weather, applicable NOTAMS, airfield bird condition, fuel on board, location, altitude, etc. Once all questions have been asked, the EP pilot will come to attention and recite the following:

"Sir, I have the aircraft. I will maintain aircraft control, analyze the situation, take the proper action, and land as soon as conditions permit."

If the stand-up scenario is in the formations phase, the EP pilots will add the following:

> Number "One" – *"In addition I will clear and plan for the formation, and monitor "two."*
> Number "Two" - *"In addition I will keep lead in sight, maintain flightpath deconfliction and position as directed by lead"*

Maintain Aircraft Control *"Sir, to maintain aircraft control I will…"*– Fly the Aircraft! Make positive stick, rudder and PCL inputs to ensure continued flight in reaction to the situation. The appropriate reaction will depend on the situation encountered. It may be to recover to level flight, initiate a MAX power climb, or even decelerate to below 150 KIAS. ***For any malfunction or indication that may result in engine failure, execute a Turn-Climb-Clean-Check before anything else***. If the initial indications warrant a BOLDFACE procedure, you may execute it as part of Maintain Aircraft Control.

- Contact: If in an unusual attitude, perform a contact recovery. Provide a pitch and power setting using contact references ("I will set 51% torque, and ½ ground, ½ sky to maintain a wings level attitude."). If in the MOA,

describe how to maintain MOA boundaries ("After I perform the nose high recovery, I will set 55% torque, 30º of bank, ½ ground, ½ sky to maintain MOA boundaries.

- Instrument: If in an unusual attitude, perform an instrument unusual attitude recovery. Provide a pitch and power setting using instrument references ("I will set 51% torque, and maintain wings level on the EADI., pitching for zero VSI"). As always, maintain MOA boundaries, if applicable.
- Formation: If appropriate, the malfunctioning aircraft will call Knock-it-Off ("Reno Knock-it-Off." "Reno 1 Knock-it-Off." "Reno 2 Knock-it-Off, light in the cockpit.") If in an unusual attitude, perform a recovery while keeping lead in sight. If the malfunctioning aircraft is in the number 2 position, he/she move to a safe position (no closer than route) before looking into the cockpit. If the indications require further analysis or the execution of checklists, the malfunctioning aircraft will normally take the lead. A good technique is to send the number 2 aircraft to a maneuverable position once the EP aircraft takes the lead (e.g. Chase, Fighting Wing). If the EP requires immediate action (loss of thrust, visible fire in the setup), the EP aircraft will maintain flightpath deconfliction while executing the Turn-Climb-Clean-Check, take the lead, and direct "two" to an appropriate position. Maintain element integrity to the max extent for the situation.
- On the Ground: Bring the aircraft to a controllable speed; use the ABORT Boldface if applicable. Set the parking brake if practical then analyze the situation.

Analyze The Situation *"Sir, to analyze the situation I will look…"*– In a Stand-Up scenario, time stands still during this portion of the EP. It is important to analyze every part of the aircraft you can to provide an accurate diagnosis of the problem. If you receive a Master Warning/Caution or Fire Light with an accompanying decaying tone, determine which light is illuminated on the CWS Annunciator Panel, and once the origin is known, push the applicable Warning/Caution to silence the tone and ensure a new tone is received if additional malfunctions occur. In all cases, specific operational limits/ranges should be used to analyze engine instruments, as opposed to "In the green." Students will be given a range of realistic ops limits that test their knowledge of the affected system. ***If at any point during the analysis a problem that may result in engine failure is suspected*** (Chip light, loss of thrust, High ITT, centerline bird strike, low fuel pressure, etc.)***, pause the analysis and accomplish an immediate Turn-Climb-Clean-Check.*** After this is accomplished, return and finish a complete analysis before taking any additional actions, including BOLDFACE procedures. If the emergency occurs on the ground, an abort may be accomplished during the analysis (in accordance with the Takeoff Emergencies section of the Mission Briefing Guide), however, no further action should be taken until a complete analysis is accomplished.

Obviously, time will not stand still during the analysis of a real-life emergency, however, it is still incumbent on the pilot to ensure a full analysis has been accomplished before taking any actions that may limit his/her ability to safely recover the aircraft.

Take the Proper Action *"Sir, I have analyzed the situation as a hydraulic system leak, to Take the Proper Action I will…"* – Accomplish any BOLDFACE procedures deemed necessary by the analysis. Declare an emergency with ATC or Sunfish if required and begin the recovery (direct to High Key, short vectors for the ILS, direct Marble for the straight-in pattern, etc), then get into the checklists. Be sure to review the checklists for any accomplished BOLDFACE procedures, as many have additional steps and Notes, Warnings, and Cautions that many apply to the scenario. Next review the checklists that relate to the indications given during the analysis. Time and conditions permitting, be sure to review any checklists that may apply as the conditions of the emergency evolve (e.g. review the Engine Failure During Flight checklist if you have a Chip Light, as it may lead to engine failure).

Land As Soon As Conditions Permit – Navigate to the most suitable airfield based on the emergency and land via the most appropriate means.

- Land as soon as possible – Continued flight is not possible (e.g., engine failure) or questionable (e.g., CHIP annunciator) and a landing must be made at the nearest suitable airfield. The nature and the severity of the malfunction will determine the most suitable airfield. If the nearest airfield has a 3,000 foot runway, it may be more dangerous to land at that field than to fly further to an airfield with a longer runway. Pilots must temper their desire to land as soon as possible with a given malfunction and the totality of the circumstances.

Distracters to a pilot‘s ability to properly perform an ELP may include a lack of proficiency, a lack of accurate instrumentation (i.e. PSTD with Np less than 100%, or dashes for field values), weather, or the stress of an actual emergency. “Bubble Hopping,” the process of climbing toward a more suitable runway while still within dead engine glide to the closer, less desirable runway, under these conditions is permissible and encouraged. However, “Bubble Hopping” for convenience to either the aircrew or maintenance is strongly discouraged except for the most benign of malfunctions. (i.e. Signal Control Unit logic malfunction, where the CWS improperly indicates a more severe malfunction than is actually occurring.) Bottom line: ***At no point should a pilot get off dead-engine glide profile with a suitable field in order to reach a more desirable runway.***

- Land as soon as practical – Emergency situation is not as urgent. Although the sortie should be terminated, an immediate landing is not necessary. For local sorites, “land as soon as practical” generally means return to KCBM. For off-station sorties, depending on the severity of the EP, “land as soon as practical” may mean diverting to a closer suitable airfield than the original destination.

GROUND EMERGENCIES

1. Abort Start Procedure

INDICATIONS

- Start sequence proceeds normally then terminates automatically, or
- Battery Bus light illuminates
- ST READY lights extinguishes for any reason prior to 60% N1
- **No** start - No ITT rise within 10 seconds of fuel being introduced (fuel flow indications), or
- **Hung** start - Normal N1 increase is halted (normally about 13-20%), or
- **Hot** start - ITT rate of increase appears likely to exceed 1,000o C.

ANALYSIS

- PMU sensed a problem with the start sequence and caused an automatic abort start, or
- Caution and Warning panel illuminates: Note, aural tones will be inhibited during engine start until N1 is above 50%. Pilot‘s crosscheck should begin with voltage drop when the starter is engaged, particularly when starting off the battery.
- PMU failed to sense a problem and required the pilot to terminate the start.

ACTIONS

- Accomplish **Abort Start Procedure** (in Engine Section of Checklist).
- Pulling the PCL to CUT-OFF or STARTER switch to AUTO/RESET aborts the start immediately.
- Motoring the engine by selecting Manual on the Starter Switch for 20 seconds will help to both cool the engine and clear any introduced fuel.

CONSIDERATIONS

- Common situations which will cause a Hot Start / PMU abort are Battery starts with:
    - Low Voltage (< 23.5 V per dash 1, but some commands have instituted higher more restrictive voltage requirements up to 24.5 V)
    - Hot Weather, the IOAT > 80o C (Necessitating a Motoring Run and further weakening the battery)
    - Cold Weather (IOAT < 0o C). Possible poor battery performance/thicker oil.
    - Aircraft parked with a tailwind.
- If after the start is initiated, the PCL has been inadvertently advanced past the Start Ready position (ST READY no longer illuminated), prior to N1 reaching 60%, the PMU will not cut off fuel to terminate a start if a hot or hung start is detected. In this case, the start **must** be manually aborted by:
    - Moving the PCL back to CUT-OFF position, or
    - If the PCL has not been advanced past the idle gate, reselecting the starter to AUTO/RESET.
    - Once past the idle gate, the PCL must be moved to CUT-OFF position to abort the start.
- Do not attempt another start unless the cause of the abnormal start has been determined to be a weak battery.
- Notify maintenance of degree and duration of any over-temperature.
- If motoring the engine is warranted, observe the starter duty cycle limits (each start attempt, regardless of length, is considered to be one duty cycle):
    - First Duty Cycle - Motor for 20 seconds, then wait 30 seconds for cooling period.
    - Second Duty Cycle - Motor for 20 seconds, then wait 2 minutes for cooling period.
    - Third Duty Cycle - Motor for 20 seconds, then wait 5 minutes for cooling period.
    - Fourth Duty Cycle - Motor for 20 seconds, then wait 30 minutes for cooling period.
- To preclude a potential hot start, use a power cart.

2. Fire Warning On Ground

INDICATIONS

- Fire Light and Master Warning Light illuminated with accompanying aural tone, or
- Visual smoke or fire, or
- Engine indications (e.g., High ITT, fluctuating or high fuel flow), or
- Notification from exterior sources (i.e., ground crew, tower, or other aircraft).

ANALYSIS

- FIRE!
- Immediate evacuation of the aircraft after it has been stopped.

ACTIONS

- Perform **Emergency Engine Shutdown On The Ground BOLDFACE** (in Engine Section of Checklist).
- Accomplish **Emergency Ground Egress** Procedure (in General Section of Checklist).

CONSIDERATIONS

- On the ground, treat any fire indication as a confirmed fire.
- For aircraft egress:
    - In a situation (e.g., fire or imminent collision) requiring immediate ground egress, the ejection system affords a 0/0 ejection capability.
    - If the ISS mode selector is set to BOTH, both seats will eject, even if one is safety pinned.
    - Thus, ensure ISS switch is in SOLO and both seat pins are installed before unstrapping.
    - If required, right side egress is possible with use of CFS - ensure oxygen mask is on and visor is down prior to actuating the CFS system.
    - Internal CFS handles activate CFS charge for the respective transparency.
    - Ensure FCP pilot knows what to do (e.g., pulling Firewall Shutoff Handle and CFS handle usage) before turning Battery to OFF (after which the Intercom will be off). If inexperienced pilot in FCP, it may be best for RCP IP to take Battery control and then turn OFF when appropriate.
    - See EMERGENCY GROUND EGRESS.

3. Emergency Engine Shutdown

INDICATIONS

- Engine fire, prop strike, chip light, departing a prepared surface, or any other serious ground emergency.

ANALYSIS

- Immediate shutdown of the engine is imperative.

ACTIONS

- Perform **Emergency Engine Shutdown On The Ground BOLDFACE** (in Engine Section of Checklist).
- Accomplish **Emergency Ground Egress** Procedure (in General Section of Checklist), as required.

CONSIDERATIONS

- After accomplishing **Emergency Engine Shutdown On The Ground BOLDFACE**:
  - If **Emergency Ground Egress** is not warranted, complete normal checklists.
  - If **Emergency Ground Egress** is required, placing the ISS to SOLO and the inserting the seat pins are the critical first steps.
- Communication will be unavailable with the Battery OFF.
  - A brief radio call to Ground or Tower will help expedite the resolution of the problem - provide your aircraft location.
  - Discuss with other crewmember your expectations before turning off the Battery - egress direction may be necessary.
- See EMERGENCY GROUND EGRESS.

4. Emergency Ground Egress

INDICATIONS

- Any situation that requires immediate evacuation of the aircraft after it has been stopped and the engine has been shut down.

ANALYSIS

- Immediate evacuation of the aircraft required after it has been stopped.

ACTIONS

- Accomplish **Emergency Ground Egress** Procedure (in General Section of Checklist).

CONSIDERATIONS

- Bring the aircraft to a full stop before beginning the egress.
- If not under a shelter and the aircraft is engulfed in flames or collision is imminent, consider ejecting - it may be the best option.
- If you have departed the prepared surface or experienced any other unusual situation that may have caused structural damage, the canopy may be difficult or impossible to open and/or the CFS system rendered inoperative. Ensure the canopy will open before unstrapping and eliminating the ejection option.
- Other than ejection on the ground, there are two ways to exit the cockpit - Normal Egress or CFS:
    1. Normal Egress - You should ensure the canopy is going to open before unstrapping (i.e., ensure that it is not jammed by the incident that has led to your Emergency Ground Egress) so as to still be able to eject, should that option of egress need to be exercised.
    2. CFS - If the canopy cannot be opened normally or if it is necessary to exit from the right side of the aircraft, rotate the CFS handle 90 degrees counterclockwise and pull. You should ensure the canopy is going to fracture before unstrapping. This must be done in both cockpits as each handle only fractures the corresponding transparency. If initiated externally by ground crew, both transparencies will fracture.
        - To prevent injury, ensure the oxygen mask is on and visor down prior to actuating the CFS. Consider disconnecting the oxygen mask hose from the CRU-60/P to eliminate breathing difficulty.
- Communication will be unavailable with the Battery OFF.
    - A brief radio call to Ground or Tower will help expedite the resolution of the problem - provide your aircraft location.
    - Discuss with other pilot your expectations - egress direction may be necessary (e.g., Twist and Pull CFS).
- Due to the position and loop design of the ejection handle, emergency ground egress poses the very deadly risk of inadvertent ejection with the canopy open. This risk is completely mitigated with properly pinned ejection seats; therefore, the most important action in the ground egress sequence is to ensure both seats are pinned prior to opening the canopy. Also, speed during emergency ground egress must be tempered with the risk of injury or death due to mistakes during a rushed egress. Ultimately, crews must understand and master the process and coordination required during emergency ground egress. Thoroughly cover those duties during mission briefing.
- Egress - After setting ISS selector to SOLO and installing the seat pins, disconnect top to bottom; shoulder harnesses, lap belt, seat kit and leg straps (Think 2-1-2-2).
    - Oxygen hose, emergency oxygen hose, comm leads and anti-G suit connection will pull free while vacating cockpit. Leg garters will pull through D-rings if released with quick release mechanism.
    - After clear of the aircraft, exit at a 45 degree angle off the tail and meet 300 feet from the aircraft. Use caution for responding emergency vehicles.

TAKEOFF EMERGENCIES

1. Abort

INDICATIONS

- Any system failure affecting safety of flight realized before Max Abort Speed during takeoff roll.

ANALYSIS

- The decision to abort or continue is based on several factors including the nature of the emergency, speed, configuration, the length of runway remaining, runway condition, terminal weather conditions and traffic.
- If it becomes necessary to abort the takeoff, concentrate on maintaining aircraft control, specifically directional control, while stopping the aircraft on the remaining runway.

ACTIONS

- Perform **Abort BOLDFACE** (in Takeoff Section of Checklist).
- Accomplish **Abort** Checklist clean-up items (in Takeoff Section of Checklist).

CONSIDERATIONS

- Making the decision to Abort or Takeoff – Particularly during the takeoff roll, the T-6 is unanimously considered a "Stop Oriented" aircraft. Determine whether the greater risk will be that of continuing the takeoff and getting airborne with the indicated problem or merely aborting from 85 knots. Most UPT bases use the landing gear handle being raised as a go/no go point to continue or takeoff especially for engine related malfunctions. Another technique for longer runways is to use 50% of the runway length as a go/no go point.
- In the event of an engine fire or failure, smoke and fumes, electrical failure, hydraulic failure or fuel leak, you may need to stop the aircraft straight ahead and egress on the runway. If taxiing clear of the runway, taxi to the hot brake area (see IFG or ask Ground Control) or back to parking, as appropriate.
- If there are no barriers up (e.g., Randolph runways 14R/32L and JPPT inside runways), any overrun affords additional paved surface to stop (e.g., 1,000 feet at Randolph).
- If stopping distance is marginal, maximum deceleration on a dry runway is obtained by using maximum braking. For maximum braking, apply one single, smooth application of brakes with all three wheels on the runway, increasing pressure as airspeed decreases. Apply enough stick back pressure to keep nose gear just on the ground but without the nose strut compressed to ensure maximum weight is on the main gear.
- Above 80 KIAS, use caution as the chances of achieving maximum braking when the weight on wheels is reduced by lift are greatly decreased. Locked brakes are difficult to detect until well after the fact. At the first sign of a skid or a directional control problem, discontinue braking and then cautiously reapply.
- Beware of Hot Brakes - if appropriate, refer to the IFG for hot brake locations (normally at EOR).
- If you abort for a fire, when the aircraft is under control, shut down the engine by moving the PCL to CUT-OFF position and pulling the Emergency Firewall Shutoff handle.
- If departing the prepared surface, perform **Emergency Engine Shutdown On The Ground BOLDFACE** (in Engine Section of Checklist). After the engine is shut down, you will lose nose wheel steering.
- If approaching a raised BAK-15 (i.e., raised web barrier) as is common at the departure end of runways used by T-38s, pilots must steer around it to include departing the prepared surface if necessary, or eject before engagement. Significant aircraft damage can be anticipated and webbing may preclude normal canopy opening.
- If approaching a lowered BAK-15, there is no need to avoid it but discontinue braking until past the barrier.

- Accomplish **Emergency Ground Egress** Procedure (in General Section of Checklist), as required. Structural damage may make the canopy difficult or impossible to open and render the CFS system inoperative. Ensure the canopy will open before unstrapping and eliminating the ejection option.
- TOLD is only valid for initial takeoff.
- See ENGINE FAILURE IMMEDIATELY AFTER TAKEOFF.

TAKEOFF

2. Aircraft Departs Prepared Surface

INDICATIONS

- You are no longer on or will imminently depart the prepared surface.

ANALYSIS

- Aircraft has departed or will depart the prepared surface due to a number of possible factors including wheel brake failure, blown tire, or directional control problems.

ACTIONS

- Perform **Emergency Engine Shutdown On The Ground BOLDFACE** (in Engine Section of Checklist).
- Accomplish **Emergency Ground Egress** Procedure (in General Section of Checklist).

CONSIDERATIONS

- Consider ejection if collision with an obstacle or travel into questionable terrain is likely.
- Once the engine is shutdown and hydraulic pressure is depleted, NWS will become unavailable and differential braking will be needed for steering.
- Once off the prepared surface, focus on bringing the aircraft to a safe stop. Do not attempt to steer back onto the runway.
- Communication will be unavailable with the Battery OFF.
    - A brief radio call to Ground or Tower will help expedite the resolution of the problem - provide your aircraft location.
    - Discuss with other crewmember your expectations - direction may be necessary.
- Transit on an unprepared surface may cause structural damage making the canopy difficult or impossible to open and/or rendering the CFS system inoperative.
- Other than ejection on the ground, there are two ways to exit the cockpit - Normal Egress or CFS:
    1. Normal Egress - You should ensure the canopy is going to open before unstrapping (i.e., ensure that it is not jammed by the incident that has led to your Emergency Ground Egress) so as to still be able to eject, should that option of egress need to be exercised.
    2. CFS - If the canopy cannot be opened normally or if it is necessary to exit from the right side of the aircraft, rotate the CFS handle 90 degrees counterclockwise and pull. You should ensure the canopy is going to fracture before unstrapping. This must be done in both cockpits as each handle only fractures the corresponding transparency. If initiated externally by ground crew, both transparencies will fracture.
    - To prevent injury, ensure the oxygen mask is on and visor down prior to actuating the CFS. Consider disconnecting the oxygen mask hose from the CRU-60/P to eliminate breathing difficulty.
- For the **Emergency Ground Egress**, disconnect top to bottom; parachute riser releases, lap belt, SSK fittings and leg lines (Think 2-1-2-2).
    - Oxygen hose, emergency oxygen hose, comm leads and anti-G suit connection will pull free while vacating cockpit. Leg garters will pull through D-rings if released with quick release mechanism.
    - After clear of the aircraft, exit at a 45o angle off the tail and meet 300 feet from the aircraft. Use caution for responding emergency vehicles.

TAKEOFF

3. Tire Failure During Takeoff

INDICATIONS

- Aircraft pulls toward failed side, or
- Rumble or Shudder - could be mistaken for nose wheel shimmy, or
- Reported by RSU/Tower/Wingman.

ANALYSIS

- Tire Failure on Takeoff

ACTIONS

- Accomplish **Tire Failure During Takeoff** Procedure (In Takeoff Section of Checklist):
- Perform **Abort BOLDFACE**, or
- Continue Takeoff and do NOT retract gear or flaps.
- Accomplish **Tire Failure During Takeoff** Checklist clean-up items.

CONSIDERATIONS

- Often difficult to tell if tire is flat at high speeds so may go undetected
- Making the decision to Abort or Takeoff - Determine whether the greater risk will be that of aborting (e.g., considering speed and aircraft weight) or that encountered continuing the takeoff.
- Leave the gear and flaps down.
- It is easy to exceed 150 KIAS with gear and flaps extended.
- Notify the RSU/Tower of possible FOD on the runway.
- Fuel permitting, get a chase ship.
- Be prepared for loss of braking or brakes on one or both sides.
- Land on side of runway corresponding to the good tire (i.e., put the drag in the center of the runway).
- Use rudder, brakes, and nose wheel steering to maintain directional control.
- Aircraft have proven to be very controllable with blown tires. Many are discovered in the chocks.
- Stop on the runway - do not taxi with a flat tire.
- If departing the prepared surface, perform **Emergency Engine Shutdown On The Ground BOLDFACE** (in Engine Section of Checklist). After the engine is shut down, you will lose nose wheel steering.
- Accomplish **Emergency Ground Egress** Procedure (in General Section of Checklist), as required. Structural damage may make the canopy difficult or impossible to open and render the CFS system inoperative. Ensure the canopy will open before unstrapping and eliminating the ejection option.
- If it is desired to leave the flaps down once in the chocks or stopped on the runway, the Hydraulic accumulator must be discharged prior to shutting off the battery. If the battery is shutoff with the hydraulic accumulator pressurized, the flaps will raise to the FLAPS UP position regardless of flap handle position.

TAKEOFF

4. Engine Failure Immediately After Takeoff (Sufficient Runway Remaining Straight Ahead)

INDICATIONS

- Total loss of power, or
- Rapid reduction of airspeed, or
- Master Warning Light illuminated with accompanying aural tone, GEN, FUEL PX, and OIL PX followed by OBOGS FAIL annunciators illuminated, or
- Propeller no longer spinning or spinning slowly.

ANALYSIS

- Engine failure, flameout, or seizure on Departure Leg soon after take off.

ACTIONS

- Perform **Engine Failure Immediately After Takeoff** (Suitable Runway Remaining Straight Ahead) **BOLDFACE**.

CONSIDERATIONS

- If airborne in the presence of indications of a possible fire, loss of torque or imminent loss of torque with sufficient runway remaining, the best option is to land straight ahead.
- You must consider your speed, altitude and runway remaining in front of you when making the decision to abort or continue the takeoff. One technique for assessing this in the event of a malfunction is to bunt the nose down to level flight and ascertain whether there is still 3,000 feet in view over the nose (e.g., using the precision instrument approach runway markings or the runway remaining markers on the sides of the runway). If there is 3,000 feet, sufficient runway may exist to glide to the runway and stop.
- If minimal runway remains, consider leaving the PCL at IDLE (i.e., not in CUT-OFF) to use the drag of the unfeathered prop to maximize the runway available by minimizing your glide distance. In this case, however, the drag of the unfeathered prop will most likely require you (unless already very fast) to lower the nose significantly (i.e., more than 10o nose low) to maintain the 110 KIAS minimum and require you to begin the round out significantly earlier than normal. Conversely, positioning the PCL to CUT-OFF will rapidly feather the prop allowing a more shallow descent to the runway but will also increase landing distance.
    - Energy state should be the deciding factor. For a high energy state, use the drag of the unfeathered prop. For lower energy states, minimize drag by placing the PCL to CUT OFF.
    - Ensure that the landing gear is (or will be) down and locked. Consider using flaps to increase drag, lower landing (and stall) speed, and shorten landing distance.
    - Critical to completing a safe landing is maintaining a minimum of 110 KIAS until starting the flare. If airspeed is allowed to reduce to less than 110 KIAS, sufficient lift may not exist to arrest your descent.
- With a loss of hydraulic pressure, landing gear cannot be lowered by normal means. Pulling the emergency gear extension handle will be required to lower the gear. Do not sacrifice aircraft control while troubleshooting or lowering gear with emergency system. Without hydraulic pressure, nose wheel steering will also be lost. Maintain directional control with rudder and differential braking.
- For maximum braking, apply one single, smooth application of brakes, increasing pressure as airspeed decreases. Above 80 KIAS, use caution as the chances of achieving maximum braking when the weight on wheels is reduced by lift are greatly decreased. Locked brakes are difficult to diagnose until well after the fact. At the first sign of a skid or directional control problems, discontinue braking and then cautiously reapply.

- If the engine is still producing torque and the decision is made to stay airborne, consider intercepting the Emergency Landing Pattern (ELP). In VMC, the appropriate means of maintaining aircraft control would be to ―Turn-Climb-Clean‖ toward Low Key in accordance with the **Precautionary Emergency Landing** Procedure (in the Engine Section of the Checklist).
- Maintain a minimum of 120 KIAS when maneuvering to intercept the ELP.
- If remaining runway or suitable landing surface (e.g., taxiway or other runway) does not exist and thrust is insufficient to maintain level flight, immediate ejection is recommended. The likelihood of a safe ejection is greatly increased by making the decision to eject early. If the decision to eject is made, placing the PCL in CUT-OFF will reduce drag and allow more time for the ejection.
- Pre-flight planning is critical for minimizing your decision time should you lose the engine.
- Although we can operate on fields as short as 4,000 feet in length, runways shorter than 5,000 feet will not normally provide sufficient runway to get airborne, lose an engine, and then land within the remaining runway.
- Avoid Intersection takeoffs as they waste valuable runway length!
- Study the airfield diagram to determine possible crossing runways, overruns, or taxiways that may be used as a landing surface. Have a planned minimum speed and/or altitude for turning and landing opposite direction. Commonly used energy states for this range upwards from 180 KIAS regardless of altitude or 160 KIAS + 1000 feet AGL - either of these will normally allow a 45o-banked level turn back to and realigned with the runway with airspeed maintained above 125 KIAS (with the PCL in CUT-OFF), if the turn is initiated immediately.
- With engine failure, you will need to breathe against the anti-suffocation valve unless you pull the Green Ring.
- In all cases, sound judgment will be required to control the aircraft‘s energy state through prudent use of altitude, airspeed and configuration.

INFLIGHT EMERGENCIES

1. Engine Failure During Flight

INDICATIONS

- Master Warning Light illuminated with accompanying aural tone, GEN, FUEL PX, and OIL PX followed by OBOGS FAIL annunciators illuminated, loss of torque and airspeed; rapid decay in N1, Torque, ITT, and engine noise. Propeller movement toward feather due to loss of oil pressure. The PMU FAIL and CKPT PX annunciators may also illuminate. N1 indicates 0% RPM and oil pressure decreases to near zero.

ANALYSIS

- Continued flight questionable. Aircraft will begin descent.
- N1 will read zero. This does not mean the engine is seized (N1 does not indicate speeds below 8%).

ACTIONS

- "Turn-Climb-Clean-Check" toward interception of an ELP to nearest suitable airfield as part of maintaining aircraft control.
- Perform **Engine Failure During Flight BOLDFACE**.
- If airstart attempt is warranted, perform **Immediate Airstart** (PMU Norm) **BOLDFACE**, conditions permitting (airstart attempt included in **Engine Failure During Flight** Checklist).
- Accomplish **Immediate Airstart** (PMU Norm) clean-up items (in Engine Section of Checklist).
- If airstart successful, accomplish **Precautionary Emergency Landing (PEL)** Procedure (in Engine Section of Checklist).
- If airstart attempt not warranted or unsuccessful, accomplish **Engine Failure During Flight** clean-up items (in Engine Section of Checklist) and **Forced Landing (FL)** Procedure (in Engine Section of Checklist).

CONSIDERATIONS

- "Turn-Climb-Clean-Check" - While "Turn-Climb-Clean-Check" is derived from the first four steps of the Precautionary Emergency Landing Procedure (in Engine Section of Checklist), it is a widely-used technique for prioritizing immediate tasks in any actual or imminent torque-deficient situation. In the face of dwindling (or imminent loss of) thrust, you must turn aggressively (to minimize ground track and save energy) toward interception of an ELP to nearest suitable landing runway (—Turn‖), zoom to trade off any excess airspeed for altitude (—Climb‖) to establish a 125-KIAS glide, and ensure that you are cleaned up and/or the PCL is in CUT-OFF (to feather the prop) (—Clean‖) as soon as possible to maximize your chance of recovering the aircraft to a suitable runway. Then you can apply any necessary **BOLDFACE** and/or Checklist procedures to try and remedy the situation (—Check‖). However, **BOLDFACE** items must not be excessively delayed.
- Above 150 KIAS, an approximately 20o-nose-high zoom to either intercept a 125-KIAS glide or eject is recommended. To achieve this climb angle, raise the nose until the glare shield vents reach the horizon.
- Propeller will feather very slowly unless the PCL is fully in CUT-OFF position.
- In the event of an engine failure, a decision to airstart, land or eject must be made. The altitude at which the engine fails will determine the time available to react to the engine failure.
- Airstart - At high and medium altitudes, an airstart may be warranted (e.g., not fire, FOD or frozen).
- If unsuccessful, emergency oxygen bottle may be needed. It only provides approximately 10 minutes of oxygen so, at higher altitudes, you may need to increase glide speed to get down prior to oxygen depletion (initial altitude minus 10,000 feet divided by 10 will equal your required descent rate - 2,000 FPM will suffice in most cases).
- If gear and/or flaps are down and insufficient residual pressure exists to raise them, consider motoring the engine to produce the necessary hydraulic pressure.

- Flamed out below 2,000 feet AGL - Focus should be on flying the Forced Landing or preparing for ejection rather than attempting an airstart.
- Zoom to intercept ELP - At low altitude in close proximity to a suitable runway (e.g., in the VFR pattern), focus on zooming to intercept an ELP to the runway. Attempt to get to High Key if possible - otherwise target Low or Base Key or perform straight-in, as necessary. Hydraulic pressure may not be sufficient to operate gear and flaps as engine spools down so emergency extension will be required to lower the gear and flaps.
- Zoom to Eject - If no suitable runway exists, zoom to eject.
- If at altitude with the engine failed, consider performing **OBOGS Inoperative BOLDFACE**. Cockpit pressurization will reduce and OBOGS will be failed. The Green Ring will be your only source of Oxygen.
- If the engine is producing insufficient thrust to maintain normal flight, consider shutting down the engine.
- Two factors must be considered when making this decision:
- High Descent rate - In excess of 1,500 feet per minute at best glide speed of 125 KIAS.
- Systems Lost - Loss of systems that will accompany engine shutdown (e.g., ECS, OBOGS and hydraulics).
- If an airstart is successful, land as soon as possible.
- If the engine is shut down, refer to **Forced Landing** Procedure (in Engine Section of Checklist).

INFLIGHT

2A. Airstart General

INDICATIONS

- Engine has failed in flight at other than very low altitude and not due to fire, FOD or mechanical failure.

ANALYSIS

- Airstart may be attempted.

ACTIONS

- Perform **Immediate Airstart** (PMU Norm) **BOLDFACE** and accomplish clean-up items (In Engine Section of Checklist), or
- Accomplish **PMU Norm Airstart** Procedure (In Engine Section of Checklist) or **PMU Off Airstart** Procedure (In Engine Section of Checklist), as appropriate.
- Repeat as necessary, altitude permitting.
- Execute Precautionary Emergency Landing (PEL), Forced Landing (FL) or Eject, as appropriate.

CONSIDERATIONS

- Airstarts have not been successfully demonstrated above 20,000 feet MSL.
- An airstart will take approximately 40 seconds from the initiation of the start sequence to usable thrust - expect to lose approximately 1,200 feet during an airstart attempt during a normal 125 KIAS Glide.
- An immediate ejection should be considered if the engine fails at low altitude, a suitable landing runway is not attainable and sufficient altitude and airspeed are not available for a successful restart. Below 2,000 feet AGL, focus should be on ejection or forced landing rather than accomplishing an airstart.
- Altitude permitting use of **PMU Norm Airstart** checklist increases the chances for a successful airstart. The pilot must monitor engine parameters as the airstart progresses because the PMU will not abort an airstart for an out-of-limits condition as it would on the ground.
- Accomplish a PMU Off (Manual) airstart only for PMU malfunctions (e.g., PMU FAIL annunciator illuminated). If a PMU Off airstart must be performed, the most critical pilot action is PCL movement while monitoring fuel flow, ITT, and N1 acceleration.
- Ensuring that the PCL is CUT-OFF is critical to ensure that prop is feathered and to ensure proper starter, ignition, boost pump and PMU operation during the airstart.
- Unsuccessful Airstart - If there is no N1 rise within 5 seconds after moving the Starter Switch to AUTO/RESET, discontinue the airstart attempt by returning the Starter Switch to AUTO/RESET momentarily. Also, if there is no ITT rise within 10 seconds after fuel flow indications; discontinue the airstart attempt by returning the PCL to CUT-OFF.
- After restart, if the Generator will not reset, verify the starter switch is in NORM. The starter will drain Battery power in 10 minutes if left in MANUAL.
- If an airstart is successful, land as soon as possible.
- Maintain Situational Awareness on glide profile to suitable landing field while accomplishing procedures.

INFLIGHT

2B. Airstart
Immediate Airstart (PMU Norm)

INDICATIONS

- Engine has failed in flight but not due to fire, FOD or mechanical failure, and
- Altitude loss or time is of concern.

ANALYSIS

- Airstart may be attempted.
- Sufficient altitude and obstacle clearance to warrant an immediate airstart attempt.

ACTIONS

- Perform **Immediate Airstart** (PMU Norm) **BOLDFACE**.
- Accomplish **Immediate Airstart** (PMU Norm) clean-up items (in Engine Section of Checklist).
- Execute Precautionary Emergency Landing (PEL), Forced Landing (FL) or Eject, as appropriate.

CONSIDERATIONS

- Flamed out below 2,000 feet AGL - Primary focus should be on flying the Forced Landing or ejection:
    - Zoom to intercept ELP - At low altitude in close proximity to a suitable runway (e.g., in the VFR pattern), focus on zooming to intercept an ELP to the runway. Attempt to get to High Key if possible - otherwise target Low Key or perform straight-in, as necessary. Hydraulic pressure may not be sufficient to operate gear and flaps as engine spools down so emergency extension handle will need to be pulled to lower the gear and enable the flaps to be used. An airstart can be attempted during glide.
    - Zoom to Eject - If no suitable runway exists, zoom to eject.
- An airstart takes approximately 40 seconds from the initiation of the start sequence until usable thrust is realized - expect to lose approximately 1,200 feet during an airstart attempt in a 125-KIAS glide.
- PCL must be in CUT-OFF to feather the prop, and ensure proper starter, ignition, boost pump and PMU operation during the airstart.
- Do not delay ejection while attempting an airstart below 2,000 feet AGL.
- Unsuccessful Start - If there is no N1 rise within 5 seconds after moving the Starter Switch to AUTO/RESET, discontinue the airstart attempt by returning the Starter Switch to AUTO/RESET momentarily. Also, if there is no ITT rise within 10 seconds after fuel flow indications, discontinue the airstart attempt by returning the PCL to CUT-OFF.
- After restart, if the Generator will not reset, verify the starter switch is in NORM. The starter will drain Battery power in 10 minutes if left in MANUAL.
- If an airstart is successful, land as soon as possible.
- Expect high amperage readings (above 30 AMPS) after the airstart.

Configuration		KIAS	Pitch Angle	Glide Angle	VVI(Ft/Min)
Normal ELP Glide	Clean	125	-1	-5	1350
	Gear	120	-2	-6.5	1700
	Gear-TO Flaps	120	-4.5	-7	1800
	Gear-Ldg Flaps	120	-11	-10	2600
Best Range Glide	Clean	125	-1	-5	1350
	Gear	105	+1.5	-5.5	1500
	Gear-TO Flaps	100	-2.5	-7	1600
	Gear-Ldg Flap	95	-3	-6.5	1800
Unfeathered Prop	Clean	110	-3	-9	2350

INFLIGHT

3. Uncommanded Power Changes/ Loss of Power/ Uncommanded Propeller Feather

INDICATIONS (expect some but not necessarily all of these symptoms...)

Primary Indications:

- Noticeable, momentary loss of thrust, unexpected propeller speed and torque fluctuations, possible noise and vibrations
- Eventually, in virtually all cases, sufficient thrust is recovered
- May get a Chip light in worst cases
- Power surges.

ANALYSIS

- An **Uncommanded Propeller Feather** is generally caused by a malfunctioning Feather Dump solenoid. The malfunctioning solenoid is releasing the oil pressure from the propeller, causing it to feather. This will be accompanied by a surge in torque, a lower Np, and a loss of thrust, however, due to PMU programming, the rapid change in Np may cause the Torque and Np displays to show only dashes (resetting the PMU to Norm and back to Off should restore the displays). An Uncommanded Propeller Feather Is the only situation that will require the third step of the BOLDFACE.
- An **Uncommanded Power Change** is generally the result on a malfunctioning PMU, sending erroneous commands to either the Propeller Interface Unit or the Fuel Management Unit. Executing the first two steps of the BOLDFACE removes the PMU from the equation, and should resolve the problem.
- A **Propeller Sleeve Touchdown** is a mechanical malfunction where the propeller shaft contacts the sleeve surrounding it, interrupting the flow of oil to the propeller and causing the pitch to change, resulting in power fluctuations. The PMU is generally unable to compensate for these fluctuations appropriately; the second step of the BOLDFACE reverts the engine to mechanical controls, and may or may not eliminate the power fluctuations.

Feather Dump Solenoid or PMU Malfunction	Prop Sleeve Touchdown (PTSD)	Uncommanded Power Change/Loss of Useful Power
Np will decrease and will stabilize below 40%	Np decrease, may momentarily drop below 40%, but will normally recover above 40 %	Np may decrease at lower; probably no drop at higher speeds
Torque increase	Torque increase	Torque decrease
Loss of thrust Surging noise Prop speed slow (can see individual blades)	Loss of thrust Surging noise Prop speed slow (can see individual blades)	Loss of thrust No noise increase (or surge); noise decrease is likely
After performing Boldface, power restored in 15-20 sec	After performing Boldface, power restored in 15-20 sec	Higher ITT/RITT drives reduction in FF and N1
Highly Unlikely	Chip light possible	
	If power restores after BF, indications may reoccur	

ACTIONS

Perform **Uncommanded Power Changes/ Loss of Power/ Uncommanded Propeller Feather BOLDFACE**.

1. PCL - MID RANGE

- Mid range is a physical PCL angle that approximates the midway position between idle and max
- A PCL position above idle will provide the best chance for the engine to recover

- A midrange PCL position will minimize the potential of engine overtorque and or over temperature when the PMU is turned off.
- Minimizes further NP drop and keeps power on engine.
- Ensures that change over to Manual Mode (PMU Off) will not exceed any
- engine limits.
- Torque displayed may not reflect thrust produced

2. PMU SWITCH – OFF

- Np may recover in as little as 3 seconds, with maximum thrust available in 15-20 seconds
- Improves oil flow characteristics to propeller.
- Increases prop speed rate of recovery.
- Provides increased oil flow for remainder of flight.
- Increases capability to maintain maximum NP when power is reduced, or further damage occurs.
- Prevents NP shift when descending below 10,000 ft.
- Disables the torque limiting function of the PMU.
- Regains full use of engine capability to recover prop speed.
- Can use up to 131% torque if required.

3. PROP SYS CIRCUIT BREAKER (Left front Console) **– PULL, IF Np STABLE BELOW 40%**

- With constant airspeed and torque, RPM can be considered stable if below 40% with no upward change for a 3 second period
- In the unlikely event that an electrical malfunction triggers the prop feather solenoid, this will return the prop to normal.
- If the pilot elects to shut the engine down in flight (ref. Step 6) while in Manual Mode (PMU Off), the circuit breaker needs to be reset to feather the prop.
- Accomplish the clean-up items (in Engine Section of Checklist).

CONSIDERATIONS

- If at low altitude and the situation cannot be remedied quickly enough, a slow speed or high descent rate may require immediate ejection. 131% torque is the limit. **Use it if you need it**.
- If Np is not 100%, torque will not be indicative of thrust. i.e. 52 % torque with 55 % Np will not give you 200 KIAS.
- Prop Sleeve TouchDowns (PSTDs) and Feather Dump Solenoid Malfunctions are types of Uncommanded Prop Feathers.
- The apparent conflicting indication at the top of the Primary Engine Data Display (PEDD) of the high Torque and Low NP are the clearest indications of an uncommanded propeller feather vs Loss of useful power.
- NP stabilizing below 40% with no NP recovery would be an indication of a Feather Dump solenoid malfunction vs a Prop Sleeve TouchDown (PSTD)
- There has never been a Feather Dump Solenoid Malfunction in the T-6.
- On more than one occasion, a PSTD has resulted in dashes in the Torque and Np fields of the PEDD. Cycling the PMU switch to NORM then back to off may return values to these fields. Whether the cycling of the PMU was successful in restoring these values or not, the PMU switch should be left in the OFF position.
- If the prop unfeathers, perform a PEL if energy and weather allow.
- Do not reset the circuit breaker after a Feather dump solenoid malfunction unless the engine fails or engine shutdown in flight becomes necessary due to greater emergency- if the engine subsequently fails with the circuit breaker out, prop feathering will take significantly longer than usual as the feather dump solenoid is deactivated.

- An operating engine provides power to accessories functions (OBOGS, DEFOG, Hydraulics). Consider leaving the engine running if on profile with excess energy, and while awaiting a delayed recovery from a feathered state. Shut down the engine if marginally on profile and it does not appear that the engine is recovering in a timely manner
- If the PMU fails or is turned OFF, prop speed is regulated by the mechanical flyweight overspeed governor (100+2%). Automatic torque, ITT and N1 limiting will not be available and must be manually controlled.
- Prop should unfeather in 15-20 seconds after C/B is pulled, for a Feather Dump Solenoid Malfunction.
- Decision to land as soon as possible, perhaps to a shorter runway, needs to be tempered with reality of a PEL with a PSTD. Instrumentation with a PSTD may be lacking in indications of Torque and/or Np. In this case, VSI will be primary indicator of aircraft performance.

4. Compressor Stalls

INDICATIONS

- Loud noise, bang or backfire, fluctuation in torque, ITT, N1, and fuel flow. Flames or smoke may be visible from the exhaust stacks. Engine damage or flameout may occur.

ANALYSIS

- The engine has had a compressor stall and continued engine performance may be degraded or impossible. Stable Np at 100% may be only discriminator between a PSTD and a compressor stall.

ACTIONS

- Accomplish **Compressor Stalls** Procedure (in Engine Section of Checklist).

CONSIDERATIONS

- If engine is so underpowered that a high descent rate occurs, delays in shutting down the engine to feather the prop may result in insufficient altitude to reach a suitable landing site.
- Land as soon as possible.
- Aircrew should immediately perform the Emergency Engine Shutdown on the Ground boldface if they believe a compressor stall has occurred on the ground.

6. Inadvertent Departure From Controlled Flight

INDICATIONS

- Aircraft not responding to flight control inputs.

ANALYSIS

- Aircraft out of controlled flight.

ACTIONS

- Perform **Inadvertent Departure From Controlled Flight BOLDFACE**.
- Accomplish **Inadvertent Departure From Controlled Flight** clean-up items (in General Section of Checklist).

CONSIDERATIONS

- It is possible to depart controlled flight as a result of improper or overly aggressive control inputs near stall, mechanical failures, atmospheric conditions, or a combination thereof.
- Power setting has a strong influence on inducing or recovering from out of control conditions - reducing power immediately may allow the aircraft to recover with no other pilot intervention or action.
- If the out of control condition is allowed to progress, characteristics can be highly oscillatory and disorienting - it is crucial the pilot neutralize controls.
- If out of control below 6,000 feet AGL, eject regardless of speed, altitude, and attitude as this offers the best opportunity for survival.
- If the departure progresses to a steady state spin (i.e., sustained yaw rate, AOA 18+ and 120-135 KIAS), recovery by maintaining neutral controls is possible but time and altitude loss will be greater than with the use of anti-spin control. If altitude loss is a concern, consider applying anti-spin controls (ailerons still neutral but with full rudder opposite spin direction/turn needle and stick forward of neutral).
- Spirals - A spiral is often mistaken for a spin and most likely a result of misapplication of pro-spin controls (insufficient rudder or aft stick). If airspeed is increasing (rather than stabilizing at 120-145 KIAS as in a spin), AOA does not indicate a stalled condition, and there is oscillatory motions not typical of a spin, you are in a spiral. In this event, check and maintain neutral controls and idle power until regaining aircraft control.

6. Fire Warning In Flight

INDICATIONS

- Fire Light and Master Warning Light illuminated with accompanying aural tone, or
- Engine smoke or flames or vibrations or unusual sounds, or
- High ITT, or
- Fluctuating oil pressure, oil temperature, or hydraulic pressure.

ANALYSIS

- Possibility of fire in the engine compartment.

ACTIONS

- At first indication of a possible fire, ―Turn-Climb-Clean-Check‖ toward interception of an ELP to nearest suitable airfield as part of maintaining aircraft control. Assess whether there is a confirmed fire. Reducing the PCL toward idle as energy allows may help to assess whether there is indeed a fire or another problem (e.g., bleed air leak).
- If the fire is confirmed, perform the **Fire In Flight BOLDFACE**.
- Accomplish **Fire In Flight** clean-up items (in Engine Section of Checklist).
- If fire is not confirmed, continue PEL to nearest suitable airfield.

CONSIDERATIONS

- While ―Turn-Climb-Clean-Check‖ is derived from the first four steps of the Precautionary Emergency Landing Procedure (in Engine Section of Checklist), it is a widely-used technique for prioritizing immediate tasks in any actual or imminent torque-deficient situation. In the face of dwindling (or imminent loss of) thrust, you must point toward interception of an ELP to a landing runway (―Turn‖), zoom to trade off any excess airspeed for altitude (―Climb‖) to establish a 125-KIAS glide or 140-KIAS climb (as applicable), and ensure that you are cleaned up and/or the PCL is in CUT-OFF position (to feather the prop) (―Clean‖) as soon as possible to maximize your chance of recovering the aircraft to a suitable runway. Then you can apply any necessary **BOLDFACE** and/or Checklist procedures to try and remedy the situation (―Check‖). However, **BOLDFACE** items must not be excessively delayed.
- Confirmed Fire - If the fire is confirmed, the engine should be shut down immediately in accordance with the **BOLDFACE**. If the Engine Fire is accompanied with High ITT the PMU will try to protect the engine by trimming back fuel. This more than likely will result in zero torque. A fire is confirmed if the Fire Light is accompanied by any ―FEVER‖ indications:
  F fluctuating fuel flow.
  E xcessive ITT.
  V isual indications (e.g., smoke or flames).
  E rratic Engine Operations (e.g., fluctuating oil temperature, oil pressure, or hydraulic pressure).
  R oughness (e.g., engine vibrations or unusual sounds).
- Unconfirmed Fire - A Fire Light indicates the possibility of a fire the presence of heat within the engine nacelle - it does not indicate a confirmed fire. Do not shut down an engine for a Fire Light without any accompanying indications. Without any accompanying indications, the fire warning system may be faulty or it may indicate a bleed air leak.
- If both fire loop annunciators are illuminated but there are no FEVER indications, a bleed air leak may exist. This is a type of fire, but it is not bad enough (yet) to warrant shutting down the engine (yet). Reducing the PCL toward IDLE will decrease the amount of bleed air and possibly extinguish the Fire Light although the PCL may still need to be used as necessary to intercept an ELP. Regardless, continue to investigate for FEVER indications.
- If only one Fire annunciator is illuminated and the other loop tests good, a malfunction of the fire loop or a false fire indication may exist.
- If engine is shut down and smoke persists in the cockpit, consider using Emergency Oxygen.
- Even if a fire is not confirmed, land as soon as possible via a PEL if weather allows.

INFLIGHT

7. Smoke And Fume Elimination / Electrical Fire

INDICATIONS

- Smoke or fumes in the cockpit, or
- Smoke, flames, or sparks coming from the wings, fuselage, or any part of the aircraft.
- Possible high amperage reading.

ANALYSIS

- Electrical fire, or
- Fuselage or wing fire, or
- Contaminated ECS.

ACTIONS

- Accomplish the **Smoke And Fume Elimination / Electrical Fire** Procedure (in Electrical Section of Checklist).

CONSIDERATIONS

- If smoke jeopardizes aircraft control, the pilot has the option of actuating the CFS or ejecting.
- If CFS actuation becomes necessary, recommend only actuating the rear CFS so that forward visibility will not be marginalized. Make sure your visor is down and mask is up prior to actuating the CFS.
- Course of action depends heavily on current weather conditions (IMC vs VMC) and recovery weather.
- If possible, identify the faulty component and turn it off or pull the circuit breaker.
- Any fuselage or wing fire constitutes an extremely hazardous situation due to the proximity to fuel cells and can cause extreme damage or explosion - if a fire continues, eject.
- RAM/DUMP will help to clear smoke accumulated in the cockpit. If this is done above FL 180 descend immediately below 10,000msl and declare a Physiological Emergency.
- Shutting OFF the Bleed Air Inflow switch will stop any smoke or fumes coming in through the ECS.
- The OBOGS is not affected by the Bleed Air Inflow switch position as it is supplied bleed air through its own lines.
- If the smoke persists after using RAM/DUMP and turning OFF the Bleed Air Inflow switch, the problem is electrical and you will need to turn OFF the Battery and Generator.
- If able to maintain VMC, leave electrical power off and recover using IFG procedures. Before turning OFF the Battery and Generator, tell the other crewmember of your intention (e.g., that you will be recovering electrical out).
- If a greater emergency exists or the aircrew requires communication with ATC, the remote UHF can be utilized by means of the Aux Battery without possibly energizing faulty equipment.
- If a VMC recovery is not feasible, you will need to restore electrical power. Begin with the Auxiliary Battery. If the smoke/fumes clear after shutting OFF the Battery and Generator and you opt not to actuate the CFS, you should be able to drop your mask and give the FCP pilot direction, even without intercom.
- IMC Recovery - With only the Auxiliary Battery connected, your engine instruments will be inoperative and you will need to fly a no-gyro ASR or PAR on the Standby Instruments using the backup UHF radio for communication. Strong consideration should be given to joining on someone‘s wing for weather penetration. Emergency gear extension will be required. If Battery power is still available, flaps should work off the Hot Battery Bus. Nose wheel steering will be unavailable. Plan accordingly.
- Land as soon as possible. Accomplish **Emergency Ground Egress** Procedure (in General Section of Checklist) after stopping straight ahead on the runway.

INFLIGHT

8. PMU Failure

INDICATIONS

- Master Warning Light and Master Caution Light illuminated with accompanying aural tone, and
- PMU FAIL and PMU STATUS annunciators illuminated, and
- A possible step change in engine power (normally to a lower power condition as the fuel management unit reverts to nominal settings for manual control).

ANALYSIS

- PMU Failure.
- PMU operating in manual mode.

ACTIONS

- Accomplish the **PMU Failure** Procedure (in Engine Section of Checklist).

CONSIDERATIONS

- Use this procedure if the PMU becomes inoperative AND A RESET IS DESIRED. Aircrew must consider that the aircraft‘s engine will work fine without the use of the PMU for purposes of a recovery to home field provided no other adverse indications exist, before they decide to reset the PMU.
- In manual mode, automatic torque, ITT and N1 limiting is not available as PCL schedules fuel directly to the engine through the FMU. The pilot must exercise care to ensure that N1, ITT, and torque limits are not exceeded. Under typical conditions power will be sufficient for recovery, however Max power will not be available. ―Note: The pilot should consider moving the PCL through the full range of motion to determine power available.‖
- Also in manual mode with the PMU OFF, although engine acceleration and deceleration characteristics are essentially unchanged with the mechanical overspeed governor providing overspeed protection, care must be exercised if the propeller is accelerated to governing speed (i.e., PCL to MAX) to avoid exceeding NP limits as a torque surge can be expected.
- Before switching PMU to OFF or resetting PMU, reduce PCL to lowest practical setting to minimize power shift.
- If PMU failure is accompanied by uncommanded power changes other than anticipated step changes, do not reset PMU. Refer to **Uncommanded Power Changes/ Loss of Power** Procedure (in Engine Section of Checklist).
- If PMU fails again after reset, second reset may be attempted, but see the first bullet of this guide. If PMU fails a second time, set PMU to OFF and land as soon as practical.

INFLIGHT

9. PMU Fault

INDICATIONS

- Master Caution Light illuminated with accompanying aural tone, and
- PMU STATUS annunciator illuminated.

ANALYSIS

- PMU Fault.
- The PMU will remain online and will continue to function.

ACTIONS

- Accomplish the **PMU Fault** Procedure (in Engine Section of Checklist).

CONSIDERATIONS

- In Flight - When this occurs in flight, the PMU has detected a weight-on-wheel discrepancy between the switches and defaults to inflight settings. A reset will not be possible.
- After landing - Rather than decreasing to the ground idle N1 of approximately 60%, the PMU will stay in the higher flight idle N1 of approximately 67%, which will result in an increased landing distance. Nose wheel steering may be inoperative.
- On Ground - If PMU STATUS annunciator remains illuminated on the ground after resetting the PMU switch, confirm source of fault prior to flight. If it illuminates after landing, this is indicative of a fault that was recorded and accommodated by the PMU. Do not reset the PMU. This will assist maintenance in post flight trouble shooting.

INFLIGHT

10. Chip Detector Warning

INDICATIONS

- Master Warning Light illuminated with accompanying aural tone, and
- CHIP annunciator illuminated.

ANALYSIS

- Metal (Ferrous) material has collected on the magnetic pickups in the Reduction Gear Box (RGB), and
- If contamination is severe, gearbox may fail with little or no further warning.

ACTIONS

- At first CHIP indication, ―Turn-Climb-Clean-Check‖ toward interception of an ELP to nearest suitable field as part of maintaining aircraft control. Use power to get on profile for an ELP to a suitable field but reduce PCL to minimum necessary to intercept ELP; avoid unnecessary PCL movements.
- Accomplish the **CHIP Detector Warning** Procedure (in Engine Section of Checklist).

CONSIDERATIONS

- While ―Turn-Climb-Clean-Check‖ is derived from the first four steps of the Precautionary Emergency Landing Procedure (in Engine Section of Checklist), it is a widely-used technique for prioritizing immediate tasks in any actual or imminent torque-deficient situation. In the face of dwindling (or imminent loss of) thrust, you must aggressively turn toward interception of an ELP to a landing runway (―Turn‖), zoom to trade off any excess airspeed for altitude (―Climb‖) to establish a 125-KIAS glide or 140-KIAS climb (as applicable), and ensure that you are cleaned up and/or the PCL is in CUT-OFF position (to feather the prop) (―Clean‖) as soon as possible to maximize your chance of recovering the aircraft to a suitable runway. Then you can apply any necessary **BOLDFACE** and/or Checklist procedures to try and remedy the situation (―Check‖). However, **BOLDFACE** items must not be excessively delayed.
- Using reduced power and limiting PCL movements will minimize stress on a failing engine although previous CHIP lights in the PT-6 engine have normally resulted in one of two outcomes. Either the contamination is severe and the engine will quit soon after the CHIP light illuminates or it has indicated an isolated chip and the engine will operate normally all the way to landing. Regardless, in the event the engine quits, at any time be prepared for either a possible ejection or performance of the **Engine Failure During Flight BOLDFACE** - it will be imperative that you get the PCL to OFF to minimize drag.
- Use power, airspeed, altitude and configuration to intercept and maintain the emergency landing pattern profile. The PEL emphasizes energy management through prudent use of existing power, reducing drag and gaining altitude as necessary.‖ Temper low energy analysis and the addition of power to correct this situation with avoiding unnecessary PCL movements. If the engine fails during the climb to intercept a glide to High Key, attempt to intercept the ELP at Low Key or Base Key. Once on ELP profile, if engine fails, select PCL to CUT-OFF position (to ensure feathered prop) and fly the profile.
- Limit G‘s while maneuvering to minimize the adverse affects on the engine.
- If engine roughness is experienced and an impending failure is anticipated once on profile for an ELP, consider shutting down the engine.
- Land as soon as possible.

11. Oil System Malfunction / Low Oil Pressure

INDICATIONS

- Master Warning Light or Master Caution Light illuminated with accompanying aural tone, and
- Red or Amber OIL PX annunciator illuminated, or
- Oil pressure outside of 90-120 psi sustained range, or
- Oil pressure below 40 psi for more than 5 seconds with PCL at Idle, or
- Unusual oil pressure fluctuations, or
- Oil temperature out of limits.

ANALYSIS

- Restricted oil line, or
- Broken oil line, or
- Oil starvation, or
- Oil filter clogged/bypass valve malfunction.
- If above 17,000‘ msl, possible Signal Control Unit Logic problem

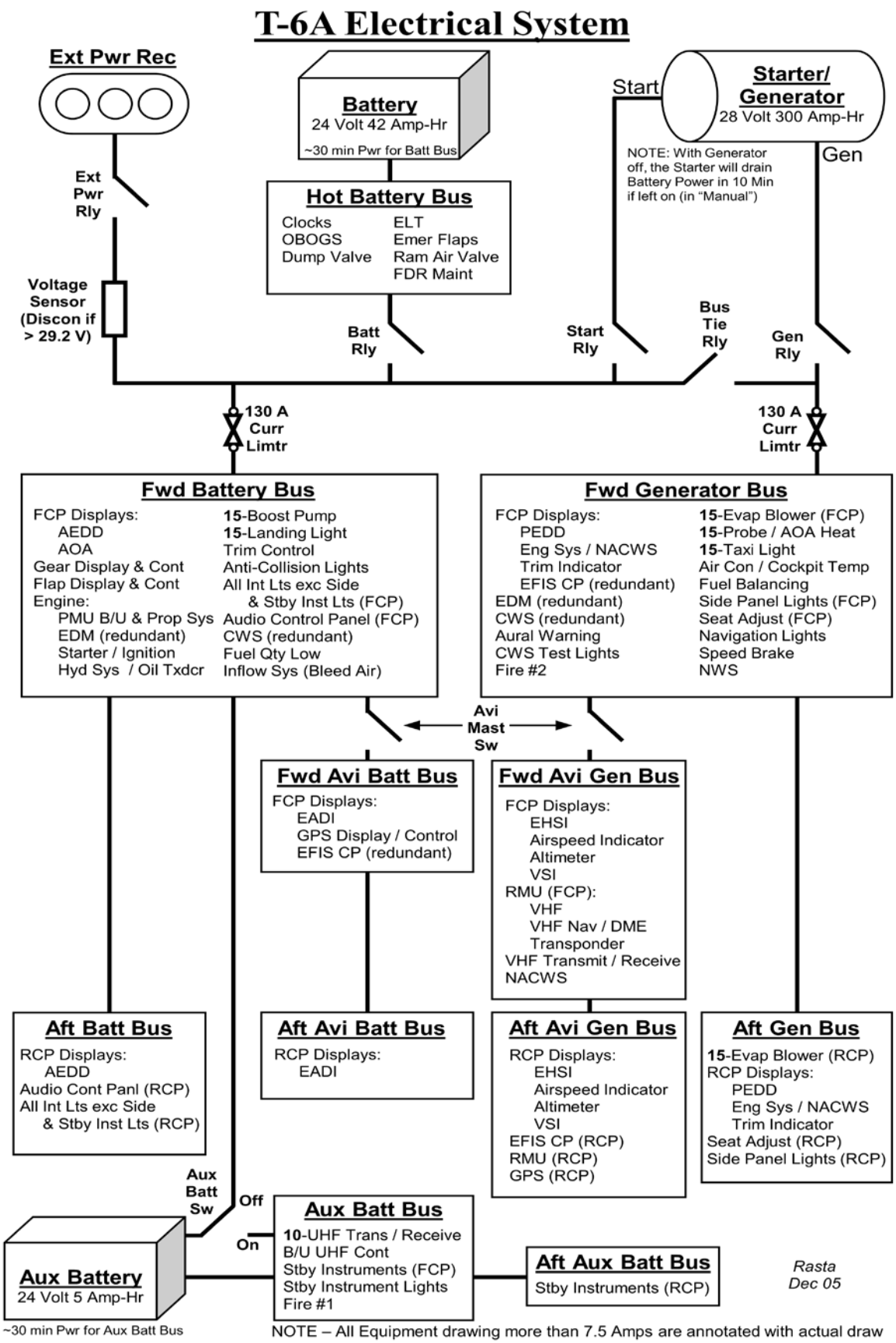
ACTIONS

- At first indication of an oil system malfunction, ―Turn-Climb-Clean-Check‖ toward interception of an ELP to nearest suitable runway as part of maintaining aircraft control. Use power to get on profile for an ELP to a suitable field but reduce PCL to minimum necessary to intercept ELP; avoid unnecessary PCL movements.
- Accomplish **Oil System Malfunction Or Low Oil Pressure** Procedure (in Engine Section of Checklist).

CONSIDERATIONS

- While ―Turn-Climb-Clean-Check‖ is derived from the first four steps of the Precautionary Emergency Landing Procedure (in Engine Section of Checklist), it is a widely-used technique for prioritizing immediate tasks in any actual or imminent torque-deficient situation. In the face of dwindling (or imminent loss of) thrust, you must aggressively turn toward interception of an ELP to a landing runway (―Turn‖), zoom to trade off any excess airspeed for altitude (―Climb‖) to establish a 125-KIAS glide or 140-KIAS climb (as applicable), and ensure that you are cleaned up and/or the PCL is in CUT-OFF position (to feather the prop) (―Clean‖) as soon as possible to maximize your chance of recovering the aircraft to a suitable runway. Then you can apply any necessary **BOLDFACE** and/or Checklist procedures to try and remedy the situation (―Check‖). However, **BOLDFACE** items must not be excessively delayed.
- During PEL, climb to ensure arrival at High Key. At any time during glide to High Key or once on ELP profile, if altitude seems insufficient, do not hesitate to use the engine to return to ELP profile. If the engine fails during the climb to intercept a glide to High Key, attempt to intercept the ELP at Low Key or Base Key. Once on ELP profile, if engine fails, select PCL to CUT-OFF position (to ensure feathered prop) and fly the profile.
- Be prepared for the engine to quit at any time and either a possible ejection or performance of the **Engine Failure During Flight BOLDFACE** - it will be imperative that you get the PCL to OFF to minimize drag.
- Limit G‘s while maneuvering to minimize adverse affects on the engine.
- If engine roughness is experienced with indications of an impending failure, consider shutting down the engine.
- If red OIL PX annunciator illuminates and oil pressure indicates 0 psi (or if only amber OIL PX annunciator and oil pressure indicates <5 psi), check OIL TRX circuit breaker on the FCP Battery Bus circuit breaker panel (left front console). If the circuit breaker is open, it may be reset.
- If both red and amber OIL PX annuciators illuminate but the oil pressure gauge indicates normal pressure, there is a signal conditioning unit failure.
- A single, momentary illumination of the amber OIL PX annunciator while maneuvering is possible due to the sensitivity of the signal conditioning unit but may not indicate a malfunction.
- Land as soon as possible.

12. T-6 Electrical Diagram



13A. Electrical Failures Generator Inoperative

INDICATIONS

- Master Warning Light illuminated with accompanying aural tone, and
- GEN annunciator illuminated.

ANALYSIS

- Aircraft Generator has kicked off line.
- Battery is providing all electrical power.

ACTIONS

- Accomplish **Generator Inoperative** Procedure (in Electrical Section of Checklist).
- Refer to IFG for Electrical Failure information.
- Electrical Malfunctions are difficult to fully recognize or anticipate. Dash 1 guidance is to descend to 10,000msl or below and plan for a worst case scenario.

CONSIDERATIONS

- The first item in the analysis of the problem is to ensure that the Starter and Generator switches are in the correct position. The Generator will not function unless the Starter Switch is in Norm. The Battery will drain in less than 10 minutes if Starter Switch is in MANUAL.
- If the Generator cannot be restored, electrical load must be reduced to provide maximum endurance on the remaining Battery load. Opening the Bus Tie will reduce electrical load on the Main Battery by shedding the Generator Bus. This will permit Main Battery operation for at least 30 minutes. Once the Bus Tie is opened, voltage and ammeter readings will not be available. Note: Flight test revealed the aircraft main battery is quite robust. 100% of aircraft tested maintained power to both buses for greater than 1 hour. This in no way guarantees this performance, rather gives the pilot a means to make an informed decision.
- Before opening the Bus Tie, consider alerting the controlling agency of your electrical problem (you will lose the transponder). Also, if you plan to close the Bus Tie on final after receiving vectors, consider configuring the avionics (i.e., RMU and EHSI) for the ILS prior to disconnecting the Bus Tie.
- With the bus tie closed, the generator and battery buses will remain powered until 16 volts. However, the EADI and EHSI will go off line at 22 volts.
- Several critical items will be lost with Generator failure and the Bus Tie open:
- All CRT displays except Electronic ADI and the Alternate Engine Data Display (you lose EHSI, Airspeed, Altimeter, VSI, Primary Engine Data Display, and Engine/Systems Display).
- Air Conditioner – Inop
- Battery voltage and ammeter readings will be unavailable (due to loss of the Engine/Systems Display).
- RMU (VHF/UHF Radio, Transponder and VOR) – Inop. Utilize UHF control head for ATC comm.
- Probe/AOA Heat - Inop
- RCP EFIS control panel.
- Refer to Electrical Failure information in IFG to clarify available system and display capability options.
- If in IMC or necessary to fly an instrument approach, you have four options:
    1. FCP pilot load GPS approach (RCP control head Inop).
    2. Fly an ASR or PAR approach.
    3. Join on another aircraft and fly a formation approach.
    4. Radar vectors to final, close the Bus Tie (by switching back to Norm) and fly ILS (or VOR or GPS approach) from either cockpit.
- You can acquire a heading display by selecting composite mode on the EADI. (Only the display is lost)
- Consider alerting the controlling agency of your intentions and then minimizing radio transmissions to preserve Battery power.
- During recovery, be prepared to accomplish **Battery and Generator Failure** Procedure (in Electrical Section of Checklist) should the Main Battery fail. In this event, FCP pilot will need to turn the Auxiliary Battery on after which your only option for penetrating the weather will be on someone‘s wing or via a no- gyro radar approach. Reviewing this will prevent unnecessary confusion if all electrical power is lost.

INFLIGHT

13B. Electrical Failures Generator Bus Inoperative

INDICATIONS

- Master Warning Light illuminated with accompanying aural tone, and
- GEN BUS annunciator illuminated.

ANALYSIS

- The CWS circuit breaker on front cockpit Generator Bus circuit breaker panel has opened, or
- There is an actual loss of the Generator Bus (and the associated avionics Buses), or
- The current limiter on the Generator Bus side has failed.
- Electrical Malfunctions are difficult to fully recognize or anticipate. Dash 1 guidance is to descend to 10,000msl or below and plan for worst case scenario.

ACTIONS

- Accomplish **Generator Bus Inoperative** Procedure (in Electrical Section of Checklist).
- Refer to IFG for Electrical Failure information.

CONSIDERATIONS

- If the GEN BUS annunciator illuminates without the actual loss of the Generator Bus, check the CWS circuit breaker on the FCP Generator Bus circuit breaker panel (right front console). Do not reset if open. Land as soon as practical.
- If the Generator is still operational and the Bus Tie is in Norm, although the Generator Bus is inoperative, the Generator will continue to charge the Battery and power the Battery Bus.
- Several critical items will be lost with Generator Bus failure:
- All CRT displays except Electronic ADI and the Alternate Engine Data Display (you lose EHSI, Airspeed, Altimeter, VSI, Primary Engine Data Display, and Engine/Systems Display).
- Air Conditioner –Inop
- Battery voltage and ammeter readings will be unavailable (due to loss of the Engine/Systems Display).
- RMU (VHF/UHF Radio, Transponder and VOR) – Utilize UHF control head for ATC comm
- RCP EFIS control panel.
- Probe/AOA Heat.
- You can acquire a heading display by selecting composite mode on the EADI. (Only the display is lost)
- If in VMC and able to remain so during descent and landing, leave the electrical system as it is and land as soon as practical.
- Refer to Electrical Failure information in IFG to clarify available system and display capability options.
- If in IMC or necessary to fly an instrument approach, you have three options:
    1. FCP pilot load GPS approach (RCP control head Inop).
    2. Fly an ASR or PAR approach.
    3. Join on another aircraft and fly a formation approach.

13C. Electrical Failures Battery Bus Inoperative

INDICATIONS

- Master Warning Light illuminated with accompanying aural tone, and
- BAT BUS annunciator illuminated.

ANALYSIS

- The CWS circuit breaker on front cockpit Battery Bus circuit breaker panel has opened, or
- There is an actual loss of the Battery Bus (and the associated Avionics Buses), or
- The current limiter on the Battery Bus side has failed.

ACTIONS

- Accomplish **Battery Bus Inoperative** Procedure (in Electrical Section of Checklist).
- Refer to IFG for Electrical Failure information.
- Electrical Malfunctions are difficult to fully recognize or anticipate. Dash 1 guidance is to descend to 10,000msl or below and plan for worst case scenario.

CONSIDERATIONS

- If the BAT BUS annunciator illuminates without the actual loss of the Battery Bus, check the CWS circuit breaker on the FCP Battery Bus circuit breaker panel (left front console). Do not reset if open. Land as soon as practical.
- If the Master Warning Light (with the accompanying aural tone) and BAT BUS annunciator are accompanied by TRIM OFF, OIL PX, HYDR FL LO and PMU STATUS annunciators, either the Battery Bus or the current limiter has actually failed.
- Opening the Bus Tie isolates the Generator Bus from any potential Battery or Battery Bus faults.
- Several critical items will be lost with Battery Bus failure:
- Loss of Inflow System (Bleed Air Inflow and Pressurization) and Landing Gear Control (dump solenoid opens Control Valve) will result in rapid decompression.
- EADI.
- All Trim (and TAD).
- Intercom.
- Primary UHF Communication.
- GPS.
- FCP EFIS control panel.
- Airstart capability & Boost Pump.
- Alternate Engine Data Display.
- OIL PX & HYD FL LO transducers (annunciators will be illuminated).
- Turning ON the Auxiliary Battery will provide power for the UHF and the Standby Instruments (and Lights) for approximately 30 minutes.
- Refer to Electrical Failure information in IFG to clarify available system and display capability options.
- You can acquire a Primary ADI by selecting composite mode on the EHSI.
- If in IMC or necessary to fly an instrument approach, you have four options:
    1. If RCP occupied, fly ILS or LOC (only RCP EFIS control panel is operational / can set LOC course).
    2. Fly ASR or PAR approach.
    3. Fly VOR approach (deselect composite mode on the EHSI to see VOR Bearing Pointer).
    4. Join on another aircraft and fly a formation approach.
- Plan to emergency extend the landing gear and lower the flaps (powered by the Main Battery through the Hot Battery Bus). Landing gear and flap position indicators will not be powered.
- If the landing gear was lowered via normal means, and then the battery bus is lost, the flaps will retract and the flap indicator will not be powered.
- If OBOGS is still operating, the Hot Battery Bus is still powered and Emergency Flaps should work.

13D. Electrical Failures Bus Tie Inoperative

INDICATIONS

- Master Warning Light illuminated with accompanying aural tone, and
- BUS TIE annunciator illuminated.

ANALYSIS

- The Battery Bus and Generator Bus are disconnected at the bus bar crosstie.

ACTIONS

- Accomplish **Bus Tie Inoperative** Procedure (in Electrical Section of Checklist).

CONSIDERATIONS

- If no other annunciators are illuminated, the generator bus will continue to operate normally and the battery bus will function as long as battery power exists (expect approximately 30 minutes).
- Turn OFF non-essential Battery Bus powered equipment (e.g., both evap blowers, exterior lights, landing and taxi lights) to extend the Battery life.
- If VMC, consider turning OFF the Avionics Master Switch (as conditions permit) to conserve Battery power as well - this will limit you to just the UHF radio for communication using the back-up UHF control head for tuning.
- Any instrument approach can be flown as long as Battery powers Battery Bus and Generator powers Generator Bus.

13E. Electrical Failures Battery and Generator Failure

INDICATIONS

- All displays inoperative.
- No CWS displays.

ANALYSIS

- Generator failed and Main Battery depleted.

ACTIONS

- Accomplish **Battery And Generator Failure** Procedure (in Electrical Section of Checklist).
- Refer to IFG for Electrical Failure information.

CONSIDERATIONS

- Complete Electrical Failure - Virtually all displays and avionics controls will be lost with both Battery Bus and Generator Bus failure:
- Bleed Air Inflow, ECS, Pressurization and OBOGs.
- All instruments except standby altimeter, airspeed indicator and magnetic compass.
- All intercom, communication and navigation capability.
- All lighting and probe/AOA anti-ice.
- All PMU controls (although PMU is still powered by PMA) and Starter.
- Emergency Oxygen, if needed, will only provide 10 minutes of useable oxygen at best.
- The fuel system will still continue to operate under motive flow as long as the engine remains operational, however, should the engine quit, you will not be able to restart. Avoid inverted or less than one G flight.
- With the Aux Battery on, only standby instruments (and lights), UHF radio and Fire detect #1 circuit will be operational, but only for approximately 30 minutes. There will be no intercom.
- Trim tabs will remain as set prior to electrical failure - although control pressures may increase, the aircraft will still be controllable. Fly at the speed the failure occurred to reduced fatigue.
- Refer to Electrical Failure information in IFG to clarify available system and display capability options.
- If the Aux Battery fails, you will not be able to fly in IMC (except on someone‘s wing) as you will have no attitude information. You will also be unable to communicate.
- If single-ship and the Aux Battery fails, fly an electrical failure pattern following normal recovery procedures (if the pattern is open). Remember to clear, since other aircraft on the recovery may not be expecting you. Letdown on Initial to fly over the Tower at 500 feet AGL. Abeam the departure end, pull up to a closed downwind. On inside downwind, accomplish the **Landing Gear Emergency Extension** Procedures (in Hydraulic Section of Checklist). Gear position indicators and flaps will not be operational. Watch the Tower for a green light in the final turn. In the absence of a red light from the tower, land.
- After landing, stop straight ahead on the runway as you will not have any safe gear down indications (three green landing gear lights and hydraulic pressure).
- Land as soon as possible.

INFLIGHT

14. Avionics Failures

INDICATIONS

- Malfunction warnings on EADI, EHSI, TA/VSI, PEDD, AEDD or Eng/Sys(/NACWS) Displays, or
- Blank EADI, EHSI, TA/VSI, PEDD, AEDD or Engine/Systems/NACWS Displays.

ANALYSIS

- Some form of avionics failure requiring pilot action to reacquire some or all of the lost display(s).

ACTIONS

- Confirm indications in both cockpits.
- With multiple possible avionics failure scenarios, refer to checklist for respective failure procedure in Electrical Section of Checklist.
- Check circuit breakers - checklist tells you which ones and where to look.
- Two circuit breakers are involved in most of the checklists: AHRS circuit breaker on the FCP Battery Bus circuit breaker panel (left front console) and AHRS/TAD circuit breaker on the FCP Generator Bus circuit breaker panel (right front console). If either of these need to be reset, the aircraft must be in straight and level unaccelerated flight for a minimum of 30 seconds after reset.

CONSIDERATIONS

- Reference alternate data sources or standby instruments for flight information.
- Good rules of thumb to follow in avionics failures:
- Use other EADI/EHSI composite switch if respective EADI or EHSI screen goes blank.
- Refer to checklist and read all warnings/cautions/notes.
- If checklist guidance fails to fix problem and affected display is absolutely required, cycle Avionics Master Switch OFF and back ON in VMC. This may fix the problem.
- Total AHRS Failure that will not reset (indicated by ATTITUDE FAIL on EADI with HDG on EHSI) - If pulling and resetting the two circuit breakers fails to reset the AHRS, an IMC recovery will be difficult but not impossible. The EADI will be Inop and the only heading display is the Magnetic Compass as the Compass Card on the EHSI will be frozen. The EHSI displayed bearing to the station should be correct although you will need to ignore the relative bearing (i.e., relative to your heading) as the compass card will be frozen. To recover, fly off the Standby Attitude Indicator and use GPS to navigate. To orient the GPS control head display correctly so that it will provide a means of graphically displaying the aircraft position and direction relative to the proximate waypoints, set TK↑ (by selecting right cursor from Super NAV5 page, scrolling to bottom of display and changing HDG↑ to TK↑). If necessary to recover through IMC, fly either a GPS or ILS/LOC approach. It will take some practice to become comfortable with the crosscheck using Standby Attitude Indicator, Primary Altimeter, Primary Airspeed Indicator, GPS (e.g., TK in NAV display), Magnetic Compass (and timed turns) and CDI.
- If in IMC or necessary to fly an instrument approach with Total AHRS Failure, you have four options:
    1. Fly GPS Approach using Standby Attitude Indicator, GPS Control Head display and CI.
    2. Fly no-gyro ASR or PAR approach off the Standby Attitude Indicator.
    3. Fly no-gyro ILS/LOC/VOR approach using GPS Control Head display to assist intercept with CI.
    4. Join on another aircraft and fly a formation approach.

INFLIGHT

15A. Fuel System Failures Low Fuel Pressure

INDICATIONS

- Master Warning Light illuminated with accompanying aural tone, and
- FUEL PX and BOOST PUMP annunciators illuminated and/or fluctuating.

ANALYSIS

- FUEL PX annunciator indicates that engine feed fuel pressure has dropped below 10 psi indicating either:
- Fuel leak, or
- A blocked fuel line, or
- Engine-driven Low Pressure Fuel Pump failure, or
- Low pressure switch failure.

ACTIONS

- Accomplish **Low Fuel Pressure** Procedure (in Fuel Section of Checklist).

CONSIDERATIONS

- BOOST PUMP annunciator indicates that the Boost Pump has been turned on by the Boost Pump Switch, the Starter Relay, or (as most likely in this case) the Low Pressure Switch.
- If the Boost Pump circuit breaker (left front console) has opened, do not reset it unless a greater emergency exists.
- If the FUEL PX annunciator is on and the BOOST PUMP annunciator is fluctuating, the engine-driven Low Pressure Fuel Pump has failed. The Boost Pump (with the Boost Pump switch in ARM) is cycling on and off each time the pressure switch senses less than 10 psi pressure with the Boost Pump OFF and then greater than 10 psi pressure with Boost Pump ON. (The FUEL PX annunciator stays on until the Master Warning Light is pushed.) Move the Boost Pump Switch to ON to stop this cycle.
- ―CAUTION: Continuous operation with the boost pump switch in the on position will cause damage to the engine driven low pressure fuel pump.‖ Do NOT hesitate to use the boost pump if you have a malfunction of the engine requiring the boost pump.
- If FUEL PX and BOOST PUMP annunciators are both on steady, either the fuel low pressure switch has failed or it is sensing less than 10 psi pressure in the engine feed fuel pressure line even with the Boost Pump ON. If the switch has not failed, this low pressure may be caused by a fuel leak or a blocked fuel line. The Boost Pump has automatically turned on in an attempt to increase the fuel pressure in the line.
- If the engine-driven Low Pressure Fuel Pump has failed (FUEL PX on steady), the engine-driven High Pressure Pump may be suction feeding and flight is limited to 10 hours. The engine cannot be restarted if the engine flames out while suction feeding.
- The engine will flame out if the engine-driven High Pressure Pump fails.
- The engine driven Low Pressure Pump and the oil scavenge pumps operate off the same accessory gear drive shaft. If this shaft has failed expect Red and Amber Oil Pressure Annunciators shortly as the engine will lose the ability to scavenge oil from the engine to the oil sump.
- Land as soon as possible via PEL if weather allows.

INFLIGHT

15B. Fuel System Failures Fuel Imbalance

INDICATIONS

- Master Caution Light illuminated with accompanying aural tone, and
- FUEL BAL annunciator illuminated.

ANALYSIS

- Fuel gauges indicate greater than 30# difference for more than 2 minutes, or
- A fuel probe or the EDM has failed or there has been some other fault in the autobalance system.

ACTIONS

- Accomplish **Fuel Imbalance** Procedure (in Fuel Section of Checklist).

CONSIDERATIONS

- An imbalance may be caused by fuel leaking from the wing or the fuel balance switch set to MAN/RESET (M FUEL BAL annunciator will be illuminated).
- A fuel probe failure will be indicated by a FP FAIL displayed on the Alternate Engine Data Display. In this case, do not attempt to manually balance fuel load. With a probe failure, a fuel imbalance annunciation may not be correct, and manual balancing attempts may cause or aggravate a fuel imbalance. Refer to **Fuel Probe Malfunction** Procedure (in Fuel Section of Checklist).
- If a fuel leak is suspected, refer to **Leaking Fuel From Wing** Procedure (in Fuel Section of Checklist).
- Do not fly aerobatics, stalls, or spins with greater than 50# imbalance.
- Manually balancing the fuel turns off the motive flow to the selected tank, thus maximizing consumption of fuel from the other tank and minimizing consumption from the selected tank.
- With one wing empty and one wing full, sufficient lateral authority exists to control the aircraft with no crosswinds but expect increased lateral stick forces.
- If the fuel imbalance remains constant or increases, consider fuel in the wing that is not feeding to be trapped. Subtract that fuel from total fuel to get usable fuel.

INFLIGHT

15C. Fuel System Failures Fuel Leaking

INDICATIONS

- Master Caution Light illuminated with accompanying aural tone, and
- FUEL BAL annunciator illuminated, and either
- Structural damage or bird strike has created a hole in wing, or
- System failure indicates fuel leaking.

ANALYSIS

- Leaking fuel from fuel tank or fuel line.

ACTIONS

- Accomplish **Leaking Fuel From Wing** Procedure (in Fuel Section of Checklist).

CONSIDERATIONS

- MANUAL FUEL BAL switch to non-leaking tank to minimize fuel loss by burning fuel from leaking tank first.
- Manually balancing the fuel turns off the motive flow to the selected tank, thus maximizing consumption of fuel from the other tank and minimizing consumption from the selected tank.
- Time and conditions permitting, consider getting a chase ship to visually inspect aircraft.
- With one wing empty and one wing full, sufficient lateral authority exists to control the aircraft with no crosswinds but expect increased lateral stick forces. If controllability is an issue, consider attempting to balance the tanks.
- Land as soon as possible.

15D. Fuel System Failures Fuel Probe Malfunction

INDICATIONS

- Master Caution Light illuminated with accompanying aural tone, and
- FUEL BAL annunciator illuminated, and
- FP FAIL illuminated on Alternate Engine Data Display.

ANALYSIS

- Accurate fuel quantity and balance cannot be determined.

ACTIONS

- Accomplish **Fuel Probe Malfunction** Procedure (in Fuel Section of Checklist).

CONSIDERATIONS

- Do not attempt to manually balance fuel load if FP FAIL is displayed on the Alternate Engine Data Display. With a probe failure, a fuel imbalance annunciation and indicated fuel may not be correct, and manual balancing attempts may cause or aggravate a fuel imbalance.
- Depending on which probe malfunctions the fuel quantity may read lower than actual. A rapid drop in fuel indications may occur.
- Fuel quantity will always be indicated from the farthest outboard functioning probe:
- **If the outer probe fails** - fuel quantity will indicate no more than 445 +/- 50# (the middle probe level).
- **If the middle probe fails** - fuel quantity will be accurate until fuel drops below 445 +/- 50# (the middle probe level) and then will indicate 308 +/- 50# (inner probe level).
- **If the inner probe fails** - fuel quantity will be accurate until fuel drops below 308 +/- 50# (inner probe level) and then will indicate 20# (half of the collector tank quantity).
- The L FUEL LO and R FUEL LO annunciators will still be operational. They use optical sensors to indicate when fuel reaches 110 pounds in the affected wing tank.

INFLIGHT

16A. Hydraulic System Failures (EHYD PX LO)

INDICATIONS

- Master Caution Light illuminated with accompanying aural tone, and
- EHYD PX LO annunciator illuminated.

ANALYSIS

- Emergency hydraulic accumulator pressure below 2400 +/- 150 psi.
- Possible hydraulic fluid leak in the emergency hydraulic system.

ACTIONS

- Accomplish **Hydraulic System Malfunction** Procedure (in Hydraulic Section of Checklist).

CONSIDERATIONS

- Monitor Hydraulic System Pressure.
- Illumination of the EHYD PX LO light may indicate a fluid leak. A leak on the emergency side of the hydraulic system that is of a small enough flow rate (< 0.25 gallons per minute) that it does not activate the hydraulic fuse, could cause all fluid to leak out of both sides of the hydraulic system and a gear-up landing would be required. Unless fuel range is a factor, lower the gear (and flaps if desired) prior to depletion of hydraulic fluid. Consider the range available once configured if a leak is suspected.
- A close approximation of the fuel required for a no-wind 100 NM divert with climbing from normal pattern altitudes to 10,000 feet MSL for the following configurations:
- Clean: 200# of fuel required for 100 NM divert.
- Gear: 300# of fuel required for 100 NM divert.
- Gear + TO Flaps: 350# of fuel required for 100 NM divert.
- Gear + Ldg Flaps: 400# of fuel required for 100 NM divert.
- When the EHYD PX LO annunciator is illuminated, the emergency landing gear and flap extension system should be considered inoperative.
- Although a chase ship may be useful to confirm a hydraulic fluid leak, landing gear extension should not be delayed until the chase ship rejoins as a fluid leak may eventually make extension impossible.

INFLIGHT

16B. Hydraulic System Failures (HYDR FL LO)

INDICATIONS

- Master Caution Light illuminated with accompanying aural tone, and
- HYDR FL LO annunciator illuminated.

ANALYSIS

- Hydraulic fluid in reservoir below approximately one quart.
- Possible fluid leak in main hydraulic system.
- Possible failure of engine driven hydraulic pump.

ACTIONS

- Accomplish **Hydraulic System Malfunction** Procedure (in Hydraulic Section of Checklist).

CONSIDERATIONS

- Apply this procedure if hydraulic pressure is dropping below normal range (2880 - 3120 psi). Loss of hydraulic pressure (out of limits, decreasing toward, or reads, 0 psi) without illumination of either EHYD PX LO or HYDR FL LO annunciator may indicate engine-driven hydraulic pump failure or partial failure.
- If HYDR FL LO annunciator illuminates and hydraulic pressure indicates 0 psi, check HYD SYS circuit breaker on the Battery Bus circuit breaker panel (left front console). If the circuit breaker is open, it may be reset.
- Illumination of the HYDR FL LO light may indicate a fluid leak in either side of the hydraulic system. If the leak is on the emergency side and is of a small enough flow rate (< 0.25 gpm) that it does not activate the hydraulic fuse, it could cause all fluid to leak out of both sides of the hydraulic system and a gear-up landing would be required. Unless fuel range is a factor, lower the gear (and flaps if desired) prior to depletion of hydraulic fluid.
- Flap extension may require use of the emergency landing gear and flap extension system. If the emergency gear handle has not been pulled previously to lower the landing gear, it will have to be pulled in order to emergency extend the flaps.
- Landing gear and flap retraction is not possible once extended using the emergency landing gear system.
- If landing field is IFR, consider descending below the weather before emergency extending the gear and flaps in case the need to divert to another field is encountered.
- Although a chase ship may be useful to confirm a hydraulic fluid leak, landing gear extension should not be delayed until the chase ship rejoins as a fluid leak may eventually make extension impossible.
- In the event a diversion becomes necessary, a close approximation of the fuel required for a no-wind 100 NM divert with climbing from normal pattern altitudes to 10,000 feet MSL for the following configurations:
- Clean: 200# of fuel required for 100 NM divert.
- Gear: 300# of fuel required for 100 NM divert.
- Gear + TO Flaps: 350# of fuel required for 100 NM divert.
- Gear + Ldg Flaps: 400# of fuel required for 100 NM divert.

INFLIGHT

17. Controllability Check (Structural Damage/Flight Control Malfunction)

INDICATIONS

- Birdstrike, collision occurs or other structural damage suspected in-flight, or
- Flight control malfunction occurs in-flight.

ANALYSIS

- Structural damage may prevent safely landing the aircraft.
- Aircraft commander must decide whether to abandon aircraft or attempt a landing.
- Use checklist to help determine if aircraft can be landed safely and what configuration and airspeed should be used.

ACTIONS

- Accomplish **Controllability Check (Structural Damage / Flight Control Malfunction**) Procedure (in General Section of Checklist).

CONSIDERATIONS

- Review **Controlled Ejection Checklist** (in General Section of Checklist) before doing **Controllability Check**.
- Get chase ship to assist in damage analysis (in the event of a mid-air collision, obtain separate chase ships).
- Reduce fuel load.
- Do not stall aircraft or slow to point that full stick or rudder is required to maintain aircraft control. In no case should the aircraft be slowed below 90 KIAS or to the activation of the stick shaker, whichever is higher.
- Time and conditions permitting, depending on the nature of the damage, consider performing initial Controllability Check in the clean configuration first to aid in possible recovery.
- Do not change configuration once **Controllability Check** is complete - complete check as close as practical to the landing airfield.
- With a suspected rudder trim push rod failure (indicated by aircraft not yawing correctly to rudder inputs), directional control on final may be extremely difficult with a crosswind component that exceeds 5 knots if the binding condition does not allow the application of proper crosswind controls. Fly a no-flap straight-in approach.
- Until on final, fly no slower than minimum controllable airspeed plus 20 KIAS.
- On final, fly a power-on, straight-in approach requiring minimum flare and plan to touchdown at no less that previously determined minimum controllable airspeed - landings have been accomplished at touchdown speeds up to 110 KIAS in the normal landing configuration.
- At touchdown speeds above 100 KIAS, anticipate increased directional sensitivity on the runway and longer landing distances.
- Although differential braking may aid in directional control upon touchdown, high touchdown airspeeds increase the potential for a blown tire, brake fade and/or overheated brakes.

INFLIGHT

18A. OBOGS System Failure/Malfunction

INDICATION

- Master Warning Light illuminated with accompanying aural tone, and
- OBOGS FAIL annunciator illuminated.

ANALYSIS

- OBOGS system is no longer producing sufficient oxygen concentration or pressure, and
- May indicate failure of the OBOGS heat exchanger, concentrator, bleed air supply, electrical system interface, or excessive system leakage, and
- May be accompanied by reduced pressure and/or quantity of breathing gas and may result in hypoxia symptoms if corrective action is not taken immediately.

ACTIONS

- Accomplish **OBOGS System Malfunction** Procedure (in Oxygen Section of Checklist).
- And, if necessary, the **OBOGS Inoperative** Procedure (in Oxygen Section of Checklist).

CONSIDERATIONS

- **OBOGS Inoperative** Procedure (in Oxygen Section of Checklist) should be accomplished in the event of engine failure or shutdown, Battery failure, or if **OBOGS System Malfunction** Procedure does not resolve the malfunction.
- At low bleed air pressure conditions (e.g., PCL idle at high altitudes), bleed air pressure may drop sufficiently to momentarily illuminate the OBOGS FAIL annunciator. This does not necessarily indicate an OBOGS failure. If OBOGS FAIL annunciator extinguishes, continue flight.
- Do not turn the OBOGS OFF and then back ON to eliminate spurious OBOGS FAIL indications - this could lead to a physiological problem if the regulator is indeed malfunctioning..
- It is possible to experience hypoxia symptoms if OBOGS has malfunctioned and cabin altitude is above 10,000 feet. If the OBOGS is inoperative at a cabin altitude greater than 10,000 feet, descend to a cabin altitude of less than 10,000 feet prior to exhaustion of the emergency oxygen supply or the effects of hypoxia may incapacitate the crew. If hypoxia is experienced or suspected, land as soon as conditions permit.
- Although the checklist allows for continued flight after Step 1 of the checklist (PCL - Advance), if an abnormally high PCL setting is required to keep the OBOGS FAIL annunciator extinguished, consideration should be given to terminating the mission and landing as soon as conditions permit.
- If cockpit pressurization functioning, ejection seat emergency oxygen may not be needed.
- If ejection seat emergency oxygen is used:
- Once activated, it cannot be shut off and will provide oxygen flow until the cylinder is depleted.
- It provides 10 minutes of oxygen best case - useful oxygen supply may only last 5 minutes or less.
    - High pressure air will make verbal communication with either the other crewmember or ATC virtually impossible.
    - Disconnecting the main oxygen supply hose from the CRU-60/P is recommended as it improves breathing capability by providing pressure relief and improves anti-suffocation capability by reducing resistance.

INFLIGHT

18B. OBOGS System Malfunction (Zeolite Dust in Oxygen Mask)

INDICATION

- Respiratory irritation, coughing, or the presence of white dust in oxygen mask.

ANALYSIS

- OBOGS concentrator beds malfunction - releasing zeolite and binder material into the breathing system.

ACTIONS

- Accomplish **OBOGS System Malfunction** (Zeolite Dust In Oxygen Mask) Procedure (in Oxygen Section of Checklist).

CONSIDERATIONS

- Check oxygen masks for presence of white dust or powder.
- If hypoxia is experienced or suspected, land as soon as conditions permit.
- If cockpit pressurization functioning, ejection seat emergency oxygen may not be needed.
- If ejection seat emergency oxygen is used:
- Once activated, it cannot be shut off and will provide oxygen flow until the cylinder is depleted.
- It provides 10 minutes of oxygen best case - useful oxygen supply may only last 5 minutes or less.
    - High pressure air will make verbal communication with either the other crewmember or ATC virtually impossible.
    - Disconnecting the main oxygen supply hose from the CRU-60/P is recommended as it improves breathing capability by providing pressure relief and improves anti-suffocation capability by reducing resistance.

INFLIGHT

19. OBOGS Overtemp

INDICATIONS

- Master Caution Light illuminated with accompanying aural tone, and
- OBOGS TEMP annunciator illuminated.

ANALYSIS

- OBOGS ducting temperature exceeds 200o F.
- OBOGS heat exchanger failed.

ACTIONS

- Accomplish **OBOGS Overtemp** Procedure (in Oxygen Section of Checklist).

CONSIDERATIONS

- If cockpit pressurization functioning, Emergency Oxygen may not be needed.
- Turning OBOGS supply lever to OFF shuts off Bleed Air to the OBOGS and the OBOGS TEMP annunciator should go out.
- If ejection seat emergency oxygen is used:
- Once activated, it cannot be shut off and will provide oxygen flow until the cylinder is depleted.
- It provides 10 minutes of oxygen best case - useful oxygen supply may only last 5 minutes or less.
    - High pressure air will make verbal communication with either the other crewmember or ATC virtually impossible.
    - Disconnecting the main oxygen supply hose from the CRU-60/P is recommended as it improves breathing capability by providing pressure relief and improves anti-suffocation capability by reducing resistance.

20. Environmental Systems Duct Overtemp

INDICATIONS

- Master Caution Light illuminated with accompanying aural tone, and
- DUCT TEMP annunciator illuminated.

ANALYSIS

- Bleed air temperature in the environmental systems duct has exceeded 300o F (any time) or 300o F in the defog duct (with defog on).

ACTIONS

- Accomplish **Environmental Systems DUCT Overtemp** Procedure (in Oxygen Section of Checklist).

CONSIDERATIONS

- Descent below 10,000MSL as required
- Moving the cockpit temperature controller toward MANUAL COLD closes the Heat Exchanger Bypass Valve and forces the bleed air through the heat exchanger. Give this step some time to work before proceeding.
- If the Bleed Air Inflow Switch is set to OFF, cabin pressurization will bleed out through the outflow valves. The canopy pressure seal and anti-g system will not be operational.
- The OBOGS system is not affected by the Bleed Air Inflow switch position as it is supplied bleed air through its own lines.

INFLIGHT

21. Trim System Malfunction

INDICATIONS

- Uncommanded movement of any trim surface or lack of movement when commanded.

ANALYSIS

- One or more components of the trim system have failed or is malfunctioning.

ACTIONS

- Depress and hold the Trim Interrupt Button on the control stick and reduce airspeed to 110 to 150 KIAS.
- Accomplish **Runaway Trim** Procedure (in General Section of Checklist).

CONSIDERATIONS

- Anytime runaway trim is suspected, T-6 pilots should know to depress the Trim Interrupt Button to disengage all trim systems.
- For most runaway trim situations, slowing to 110 to 150 KIAS will reduce stick forces. For full nose down runaway trim, maintaining higher indicated airspeeds will aid in aircraft control.
- The trim system is also completely disengaged by selecting TRIM DISONNECT on the Trim Disconnect Switch. Disconnecting the system will allow the pilot to troubleshoot any problems without uncommanded trim movements.
- If a trim system is lost, to minimize fatigue, the pilot needs to find the airspeed that minimizes workload (usually between 110 to 150 KIAS). If dual, the pilots can also share flying duties during RTB.
- At typical final approach speeds, aileron forces remain relatively light in the event of full aileron trim runaway. Leaving the AIL/EL TRIM circuit breaker in during aileron trim malfunction will enable the pilot to use pitch trim when necessary.

INFLIGHT

22. Flight with Shattered / Damaged Canopy

INDICATIONS

- Canopy appears cracked or shattered, or
- Canopy departs aircraft.

ACTIONS

- Reduce airspeed to below 150 KIAS.
- Accomplish **Flight With Shattered / Damaged Canopy** Procedure (in General Section of Checklist).

CONSIDERATIONS

- Anytime a canopy malfunction is encountered, T-6 pilots should know to slow to below 150 KIAS to minimize turbulence and cockpit noise should the canopy damage or situation worsen.
- Avoid flying over populated areas. At Randolph, an approach to runway 32L will keep you clear of most populated areas. If west of San Antonio, landing at Hondo or Kelly is also an option.

INFLIGHT

23. Canopy Unloc ked

INDICATIONS

- Master Warning Light illuminated with accompanying aural tone, and
- CANOPY annunciator illuminated, and possibly
- Visual indication that canopy is not locked (i.e., canopy handle not fully forward) or green indicators in mechanical canopy lock indicator windows not visible.

ANALYSIS

- Canopy is not fully locked -- red CANOPY annunciator will remain illuminated when Master Warning is depressed.
- Lock release lever was bumped – red CANOPY annunciator should extinguish when Master Warning depressed.
- Internal Canopy open and lift handle was bumped -- red CANOPY annunciator should extinguish when Master Warning depressed.

ACTIONS

- Reduce airspeed to below 150 KIAS, avoiding abrupt maneuvering.
- Accomplish **Canopy Unlocked** Procedure (in General Section of Checklist).

CONSIDERATIONS

- Anytime a canopy malfunction is encountered, T-6 pilots should know to slow to below 150 KIAS to minimize turbulence and cockpit noise should the canopy damage or situation worsen.
- Maintain positive G‘s on the aircraft.
- Check green latch indicators in both cockpits - do not attempt to lock the canopy in flight as this may inadvertently allow the canopy to open and depart the aircraft.
- Illumination of the light could be caused by a failure of any one of four micro-switches. Should any one switch not sense the canopy closed, the CANOPY annunciator and the Master Warning Light will illuminate (with the accompanying aural tone).
- If the canopy is obviously unlocked or ―floating‖ off the side rail, do not eject. This may cause injury during the ejection sequence. Also, in this case, the CFS may not be mated properly and therefore may not initiate.
- Avoid flying over populated areas. At Randolph, an approach to runway 32L will keep you clear of most populated areas. If west of San Antonio, landing at Hondo or Kelly is also an option.

24. Cockpit Overpressurization

INDICATIONS

- Master Warning Light illuminated with accompanying aural tone, and
- CKPT PX annunciator illuminated.

ANALYSIS

- Cabin pressurization control valve failed to open.

ACTIONS

- Accomplish **Cockpit Overpressurization** Procedure (in Oxygen Section of Checklist).

CONSIDERATIONS

- Indications of malfunctions in pressurization system:
- If cockpit pressure altitude climbs above 19,000 feet, the Master Caution Light (with accompanying aural tone) and CKPT ALT annunciator will illuminate.
- If ΔP greater than 3.9 to 4.0 occurs, the Master Warning Light (with accompanying aural tone) and CKPT PX annunciator will illuminate.
- If a ΔP other than 3.6 +/- 0.2 is observed above 18,069 feet, write it up at the end of the mission.
- CKPT PX indicates cockpit pressure differential has exceeded 3.9 to 4.0. Cockpit ΔP display changes to red. Overpressurization Safety Valve opens at 4.0 psi.
- Above 8,000 feet MSL, the pressurization system should keep the cockpit pressure at approximately 8,000 feet MSL until reaching an aircraft altitude of 18,069 where cockpit pressure altitude will begin to increase to maintain a ΔP = 3.6 +/- 0.2 psi.
- Cockpit pressure should increase from 8,000 feet at 18,069 feet MSL to 16,600 feet at 31,000 feet MSL (as a guide, above 18,000 feet, your cockpit pressure altitude should be roughly half of your MSL altitude).
- If the Bleed Air Inflow Switch is set to OFF, cabin pressurization will bleed out and approximately match aircraft altitude. All bleed air components except OBOGS will be inoperative. The OBOGS system is not affected by the Bleed Air Inflow switch position as it is supplied bleed air through its own P3 port.
- If selecting either DUMP above 19,000 feet MSL, the amber **CKPT ALT** annunciator will illuminate as cockpit pressure altitude climbs above approximately 19,000 feet.
- If a ΔP other than 3.6 +/- 0.2 is observed above 18,069 feet, write it up at the end of the mission.

INFLIGHT

25. Rapid Decompression / Cockpit Pressure Altitude Exceeds 19,000 Feet

INDICATIONS

- Master Caution Light illuminated with accompanying aural tone, and
- CKPT ALT annunciator illuminated, and possibly
- Loud noise, haze in the cockpit, or physiological indications, (e.g., ears and sinuses).

ANALYSIS

- Cabin pressurization has been lost.

ACTIONS

- Accomplish **Rapid Decompresion / Cockpit Pressure Altitude Exceeds 19,000 Feet** Procedure (in Oxygen Section of Checklist).

CONSIDERATIONS

- Above 8,000 feet MSL, the pressurization system should keep the cockpit pressure at 8,000 feet MSL until reaching an aircraft altitude of 18,069 where cockpit pressure altitude will begin to increase to maintain a $\Delta P = 3.6 +/- 0.2$ psi.
- Cockpit pressure should increase from 8,000 feet at 18,069 feet MSL to 16,600 feet at 31,000 feet MSL (as a guide, above 18,000 feet, your cockpit pressure altitude should be roughly half of your MSL altitude).
- Indications of malfunctions in pressurization system:
- If cockpit pressure altitude climbs above 19,000 feet, the Master Caution Light (with accompanying aural tone) and CKPT ALT annunciator will illuminate.
- If ΔP greater than $3.9 +/- 0.2$ occurs, the Master Warning Light (with accompanying aural tone) and CKPT PX annunicator will illuminate.
- If a ΔP other than $3.6 +/- 0.2$ is observed above 18,069 feet, write it up at the end of the mission.
- With a sudden or rapid decompression at altitudes near 20,000 feet MSL, there may be a transient OBOGS FAIL indication as the OBOGS system switches to high altitude mode to compensate for higher cockpit pressure altitudes.
- If cockpit pressure altitude exceeded 25,000 feet, land as soon as practical and obtain qualified medical assistance (flight surgeon if possible).

EJECTION

1. Controlled Ejection

INDICATIONS

- Aircraft malfunction that will not permit a safe landing.

ANALYSIS

- Ejection is the only safe course of action.

ACTIONS

- If in local area, proceed to Controlled Ejection Area, per the IFG.
- If not in local area, proceed to uninhabited area.
- Accomplish **Controlled Ejection** Procedure (in General Section of Checklist).
- Accomplish post ejection procedures:
    - *CANOPY*
    - *VISOR*
    - *MASK*
    - *SEAT KIT (Check deployed)*
    - *LPU 9P (horse collar) - as appropriate*
    - *STEER*
    - *PREPARE*
    - *LAND*
    - *RELEASES*

CONSIDERATIONS

- During any low altitude ejection, the chances for successful ejection can be greatly increased by pulling up to exchange airspeed for altitude if conditions permit. Place the PCL to OFF to feather the prop and reduce drag and trim the aircraft so the nose will not drop excessively when you let go of the stick. Avoid ejecting with a sink rate as it will degrade seat performance.
- If out of control, ejection should not be delayed as immediate ejection offers the best opportunity for survival.
- To minimize injury:
- Cover exposed skin prior to ejection to prevent injury from shards and hot fragments during the ejection sequence - sleeves down, gloves up, mask on, visor down.
- Grasp handle and pull sharply toward abdomen, keeping elbows in.
- The pilot in command (i.e., aircraft commander) is responsible for directing an ejection. However, waiting for the command to bailout is no excuse for delaying ejection in a rapidly deteriorating situation. This must be thoroughly discussed in the preflight briefing.
- The verbal and visual commands for ejection are:
- Verbal: The phrase *"Bailout, Bailout, Bailout"* issued by the aircraft commander as briefed in the preflight briefing.
- Visual: The face curtain signal (ref: AFI 11-205).
- The minimum recommended altitude for a controlled ejection is 2,000 feet AGL. Although the Martin- Baker Mark 16 ejection seat is capable of ejection at zero altitude and zero airspeed with sink rates up to approximately 10,000 fpm, your chances for a successful ejection are significantly reduced if you attempt to eject below 2,000 feet AGL. Do not delay your ejection in futile attempts to restart the engine or regain control of the aircraft.
- When ejecting over mountainous terrain exceeding 8,000 feet MSL, the manual override (MOR) handle should be used to manually separate from the seat and deploy the parachute.

- If ejecting at low speeds, one or both sets of risers may remain velcroed together following separation. This may increase decent rate and create an uncommanded turn. Manually separate the risers, time permitting.
- Prepare for a parachute landing fall:
    - On land or water – body straight, knees slightly bent, toes pointed down, hands on releases. Keep your feet and knees together, and your eyes on the horizon.
    - In trees, discard the survival kit, lower visor, - body position same as normal, ensure your thumbs protect the area below each side of your chin, and fingers are placed over your visor, tuck in your chin and place elbows together, these action should protect your face and upper extremities. Do not be in a rush to get down.
    - In power lines – attempt to maintain a small surface area by keeping body straight, put your hands on the inside of the front risers over your head with the palms facing forward and turn your head to either side. Be prepared to go through the power lines. If caught up in power lines do not allow anyone to touch you until they have confirmed that the power is off.
    - In all cases (time permitting) discard your oxygen mask (especially if landing in trees and/or water).

EJECTION

2. Uncontrolled Ejection

INDICATIONS

- Aircraft commander has ordered ―Bailout, bailout, bailout‖ or given ―face curtain‖ visual signal, or
- Aircraft is out of control below 6,000 feet AGL.

ANALYSIS

- A/C has made decision that ejection is required for aircrew survival, or
- Pilot has determined that aircraft is out of control below 6,000 feet AGL.

ACTIONS

- Discontinue preparations for ejection.
- Assume proper body position - head back, elbows close in to body, legs extended but not rigid.
- Perform **Eject BOLDFACE** (in General Section of Checklist).
- Accomplish POST EJECTION procedures:
    - *CANOPY*
    - *VISOR*
    - *MASK*
    - *SEAT KIT (Check deployed)*
    - *LPU 9P (horse collar) - as appropriate*
    - *STEER*
    - *PREPARE*
    - *LAND*
    - *RELEASES*

CONSIDERATIONS

- Same as CONTROLLED EJECTION

EJECTION

3. Use Of Terrain Clearance Charts (Ejection Envelope)

ANALYSIS

- Three charts are provided in Chapter 3 of the Dash-1 for computing Minimum Ejection Altitudes at various Indicated Airspeeds and:
  (1) Dive Angle.
  (2) Bank Angle.
  (3) Sink Rate.

CONSIDERATIONS

- Min altitudes based on initiation of ejection.
- No allowance is made for crew reaction time.
- All clearances are for sequenced, dual ejection at maximum pilot weight (271 lbs) for front seat occupant.
- Calculated for standard sea-level atmospheric conditions.
- Add 1 % additional terrain clearance for every 1 ,000 feet MSL of aircraft altitude.
- The chart is not accurate above 8,000 feet MSL due to altitude sensing device and G-limiting device which will delay parachute opening.
- A conservative minimum terrain clearance can be obtained by combining the minimum terrain clearances from each chart for each of the individual variables.
- EXAMPLE: 250 KIAS, 50° dive angle, 180° bank angle, 4,000 fpm sink rate
  625 ft + 180 ft + 70 ft = 875 ft AGL

LANDING EMERGENCIES

1. Emergency Landing Pattern (ELP)

INDICATIONS

- Signs of possible engine failure, or
- Situation requiring operation with engine at partial power, or
- An emergency encountered which requires engine shutdown.

ANALYSIS

- The emergency requires you to perform an Emergency Landing Pattern (Forced Landing or Precautionary Emergency Landing).

ACTIONS

- ―Turn-Climb-Clean-Check‖ toward interception of an ELP to nearest suitable airfield as part of maintaining aircraft control.
- Perform applicable **BOLDFACE**.
- Accomplish **Precautionary Emergency Landing (PEL)** Procedure (in Engine Section of Checklist).

CONSIDERATIONS

- ―Turn-Climb-Clean-Check‖ - ―Turn-Climb-Clean-Check‖ is derived from the first four steps of the Precautionary Emergency Landing Procedure. It is a widely-used technique for prioritizing immediate tasks in any actual or imminent torque-deficient situation. In the face of dwindling (or imminent loss of) thrust, you must point toward interception of an ELP to a landing runway (―Turn‖), zoom to trade off any excess airspeed for altitude (―Climb‖) to establish a 125-KIAS glide or 140-KIAS climb (as applicable), and ensure that you are cleaned up and/or the PCL is in CUT-OFF (to feather the prop) (―Clean‖) as soon as possible to maximize your chance of recovering the aircraft to a suitable runway. Then you can apply any necessary **BOLDFACE** and/or Checklist procedures to try and remedy the situation (―Check‖). However, **BOLDFACE** items must not be excessively delayed.
- Aircrew should strive to land the aircraft with the engine still running. Understanding known descent profiles at greater than 125 KIAS and engine efficiency techniques (i.e. technique of setting 60% torque) are imperative to minimize the time airborne and maximizing engine life. Given the nature of two of our more common malfunctions, PSTD and Red Oil pressure light above 17,000‘msl (Signal Control Logic problem), IP‘s must weigh the desire to land immediately with the possibility of performing a poor ELP due to limitations of our instrumentation, poor weather or lack of practice performing ―high speed‖ ELP‘s.
- If the engine is operating, set 4-6% for minimum drag and use power if necessary to get/stay on profile. If rate of descent (clean) exceeds 1,500 feet/minute, increase torque to achieve 1,350-1,500 feet/minute rate of descent. If engine power is insufficient to produce a rate of descent less than 1,500 feet/minute, set PCL to CUT-OFF. In this case, however, also consider the systems that will be lost when the engine is shut down (e.g., ECS, OBOGS and hydraulics). If it is desirable to leave the engine running with a higher than normal descent rate, a technique to intercept high key would be to double your current descent rate and add 500 ft. i.e. If you are descending at 2000fpm, your new High Key altitude would be 4500‘ (AGL).
- If the emergency occurs outside the traffic pattern, plan to intercept the ELP at High Key if possible to maximize chance of success.
- Public Math - pilots must become proficient with a means to calculate their energy relative to a suitable airport. Two techniques available are the Altitude/ DME method -
- Altitude Method - projects your glide range from nearby airfields - easiest means to compare your energy state to multiple airfields:

  (1) Determine max glide distance - Present Altitude AGL x 2.

(2) Determine Fields within max glide distance - NRST button, then pull out right inner knob to cycle through airfields. Determine which fields are within your glide range - you are ―in the bubble‖ for those fields.
(3) Determine which Fields are within glide distance to High Key.
(4) Determine most suitable field.

- DME Method - projects your glide range from present position - easiest means to compare your energy state to one airfield:
  (1) Determine distance to NRST airfield.
  (2) Determine minimum AGL no-wind glide altitude - Divide distance to NRST airfield by 2 and add to field elevation.
  (3) Determine if sufficient altitude exists to glide to field.
  (4) Determine if sufficient altitude exists to glide to High Key (or Low Key or Base Key).

LANDING

2. Forced Landing (FL)

INDICATIONS

- Total loss of thrust.

ANALYSIS

- Engine failure, fire, flameout, or seizure.
- Airstart not warranted or unsuccessful.
- Suitable landing area available (within glide distance).

ACTIONS

- ―Turn-Climb-Clean-Check‖ toward interception of an ELP to nearest suitable airfield as part of maintaining aircraft control.
- Perform **Engine Failure During Flight BOLDFACE**.
- Accomplish clean-up items (in Engine Section of Checklist).
- Accomplish **Forced Landing** Checklist (in Engine Section of Checklist).

CONSIDERATIONS

- ―Turn-Climb-Clean-Check‖ - ―Turn-Climb-Clean-Check‖ is derived from the first four steps of the Precautionary Emergency Landing Procedure. It is a widely-used technique for prioritizing immediate tasks in any actual or imminent torque-deficient situation. In the face of dwindling (or imminent loss of) thrust, you must point toward interception of an ELP to nearest suitable runway (―Turn‖), zoom to trade off any excess airspeed for altitude (―Climb‖) to establish a 125-KIAS glide, and ensure that you are cleaned up and/or the PCL is in CUT-OFF (to feather the prop) (―Clean‖) as soon as possible to maximize your chance of recovering the aircraft to a suitable runway. Then you can apply any necessary **BOLDFACE** and/or Checklist procedures to try and remedy the situation (―Check‖). However, **BOLDFACE** items must not be excessively delayed.
- Positioning the PCL to CUT-OFF will most rapidly feather the propeller and will conserve available energy.
  - Anticipate increased landing distance with the propeller feathered.
  - Loss of engine hydraulics results in a loss of nose wheel steering. Maintain directional control with rudder and differential braking.
  - It has been reported by pilots who have experienced engine failure, that the aircraft appears to glide better than what 4-6% torque replicates. Constant energy awareness while performing a FL is imperative.
- Do not land on an unprepared surface as it may cause structural damage making it impossible to open the canopy or fracture it using the CFS - Ejection is recommended if a suitable landing area is not available.
- If unusual circumstances such as failure of the ejection system dictate ditching or landing on an unprepared surface, perform a FL to the intended point of landing but do not extend the landing gear. This will minimize the chances of the aircraft tumbling or cart wheeling.
  - Smooth cultivated fields are the best option for forced landings on an unprepared surface. Attempt to land in the direction of the furrows. **CLEAR FOR POWER LINES**.
- Once established on profile for the ELP, lower the gear when appropriate - if the engine is not operating, there will be no normal hydraulic pressure to lower the landing gear or flaps. The emergency gear and flap extension must be used. Once the gear and flaps are extended using the emergency method, they cannot be retracted.
- Note: At this time, the Emergency Flap portion of the Emergency gear and Flap system has proven to be very unreliable. Visual confirmation (if possible) of the Landing Gear and Flap gauges is highly encouraged when ever selecting these components utilizing the emergency system.
- See CONSIDERATIONS for EMERGENCY LANDING PATTERN (ELP).

LANDING

3. Precautionary Emergency Landing (PEL)

INDICATIONS

- Any indication that would make continued operation of the engine questionable.

ANALYSIS

- Aircraft indications require that a PEL be flown (e.g., CHIP annunciator or Oil System Malfunction).

ACTIONS

- ―Turn-Climb-Clean-Check‖ toward interception of an ELP to nearest suitable airfield as part of maintaining aircraft control, and
- Continue the **Precautionary Emergency Landing (PEL)** Procedure (in Engine Section of Checklist), and
- Accomplish any other applicable checklist procedures.

CONSIDERATIONS

- ―Turn-Climb-Clean-Check‖ - ―Turn-Climb-Clean-Check‖ is derived from the first four steps of this Procedure. It is a widely-used technique for prioritizing immediate tasks in any actual or imminent torque-deficient situation. In the face of dwindling (or imminent loss of) thrust, you must point toward interception of an ELP to a suitable runway using local area familiarity, visual or GPS NRST function (―Turn‖), zoom to trade off any excess airspeed for altitude or climb using a 140 KIAS (best rate) and establish a 125-KIAS glide (―Climb‖) or 140-KIAS climb (as applicable), and ensure that you are cleaned up and/or the PCL is in CUT-OFF (in situations in which the engine has failed to feather the prop) (―Clean‖) as soon as possible to maximize your chance of recovering the aircraft to a suitable runway. Then you can apply any necessary **BOLDFACE** and/or Checklist procedures to try and remedy the situation (―Check‖). However, **BOLDFACE** items must not be excessively delayed.
- Low on Profile - If at any time, altitude seems insufficient to glide to High Key or lower than desired during ELP, use available torque to climb. If engine is operating but the rate of descent during the 125 KIAS-glide to High Key is greater than 1,500 feet per minute, consider shutting down the engine and feathering the prop to improve glide performance. In this case, however, also consider the systems that will be lost when the engine is shut down (e.g., ECS, OBOGS and hydraulics).
- Engine Failure - If the engine fails during climb, attempt to intercept the ELP to any Key position. If the engine fails during the ELP, fly the profile. A safe ejection during the ELP can usually be achieved by leveling the wings and arresting the sink rate before initiating ejection.
- Impending Engine Failure - If engine roughness is experienced or engine is vibrating excessively with indications of an impending failure, consider shutting down the engine once on profile. If the engine is producing insufficient thrust to maintain normal flight, consider shutting down engine (refer to **Forced Landing** Procedure in Engine Section of Checklist).
- High Energy - If well above the Best Range Glide profile, although excess altitude should normally be lost above the airfield of intended landing with 360 degree turns, there are two other options when an expedited recovery is desired:
    1. Intercept and maintain a 1 to 1 glide profile to Low Key altitude. The airspeed will build to upwards of 230 KIAS but the excess energy can be used to maneuver to Low Key overhead the field.
    2. Vary your glide speed and descent rate until closer to glide profile to High Key to arrive at High Key aligned with the runway at an appropriate speed to commence the ELP.
- If using IDLE power or flying with an unfeathered prop, add 500 feet to High/Low/Base key altitudes to compensate.
- With uncontrollable high power, the pilot must shut down the engine once landing is assured.
- See CONSIDERATIONS for EMERGENCY LANDING PATTERN (ELP).

LANDING

4. Wing Flap Failure

INDICATION

- Unplanned / uncommanded rolling or yawing during the operation of the wing flaps.

ANALYSIS

- Asymmetrical (split-flap) condition likely exists due to physical binding between flap segments or failure of torque link between inner and outer flap segments

ACTIONS

- Attempt to remedy the situation by reversing the flap control handle to the previous position and maintain below 150 KIAS.
- Accomplish **Asymmetric Flaps (Split-Flap Condition)** Procedure (in General Section of Checklist).

CONSIDERATIONS

- Consider either a fly by of the tower/RSU or get a chase ship to confirm flap position.
- Sufficient control authority exists to counteract yaw and roll at pattern airspeeds.
- Do not attempt to extend the speed brake when experiencing asymmetric flaps.

LANDING

5. Landing Gear Unsafe Indication

INDICATIONS

- One or more landing gear fails to indicate fully up with gear handle up, or
- One or more landing gear fails to indicate down and locked with gear handle down, or
- Red light remains on in any one of the gear position indicators.

ANALYSIS

- Gear or inboard gear doors may not be completely up or down after raising or lowering the gear handle.

ACTIONS

- Accomplish **Landing Gear Malfunction** Procedure (in Hydraulic Section of Checklist).

Put decision matrix here

CONSIDERATIONS

- The FCP Landing Gear Control Unit contains gear and door command microswitches as well as indicator lights. The RCP gear control unit contains only indicator lights and is mechanically linked to the FCP gear control. This is why the before landing checklist calls for both pilots (when RCP is occupied) to ―press down firmly‖ on the gear handle regardless of what cockpit lowers the gear handle.
- This lengthy, multi-page checklist can be confusing. Read all Notes/Cautions/Warnings for respective step before performing the step. It includes a series of ―If‖ statements to determine the nature of the malfunction and appropriate corrective action - ensure the ―If‖ statement applies before taking action.
- Activating the emergency landing gear extension system with normal hydraulic system indications and a ―non-electrical‖ gear malfunction (i.e. one gear fails to reach down and locked) could cause irreversible configuration other than all gear up or all gear down. Conference Hotel procedures should be activated prior to emergency extending the gear under these circumstances.
- In the event of landing gear malfunction in the pattern, remain below 150 KIAS and climb to high pattern and coordinate for a chase ship. If the VFR pattern is open but high pattern is not available, depart the pattern and orbit VFR below the weather. If in the Tower-controlled Hangover pattern, once established in the high pattern or after leaving the pattern (high pattern not available), coordinate with the SOF for the chase ship. If the VFR pattern is closed, consider climbing above the weather and coordinate for a chase ship with Approach control.
- Prior to recycling or emergency extending the gear, get a chase ship or fly by the tower/RSU to confirm gear position, if possible.
- AOA indexers illuminated or Landing/Taxi Lights illuminated also indicate three safe landing gear.
- With any main gear or main gear door extension or retraction anomalies, the possibility that the problem could be related to a materiel failure of the Landing or Taxi Light assembly should be considered (several of these have occurred).
- In addition to having the chase ship check the position of the gear, verifying the position of the red diagonal painted lines on the two-piece folding struts (i.e., the over-center locks), check for leaks and landing/taxi lights operation.
- If a gear fails to indicate down and locked after emergency extension, you cannot retract the landing gear to attempt a gear-up landing. For this reason, with normal hydraulic pressure, consider making several attempts at recycling the gear before using the emergency extension option.

- Preferred Landing Configurations (in order):
    (1) Three Safe Gear.
    (2) All Gear Up.
    (3) Any Combination of Gear Down that includes at least one Main Gear.
    (4) Only the Nose Gear Safely Down (if the only the nose gear is stuck down and cannot be retracted, consider ejection versus landing with this partial configuration).
- Once the gear is successfully lowered by either the normal or emergency methods, leave the gear extended and land as soon as conditions permit. Do not overfly suitable fields (i.e., 4,000 foot runways with Crash/Rescue services) to get home or to a more desirable field, even after a ―normal‖ configuration is obtained as the cause of the problem may be a materiel failure and a ―dropped object‖ is possible.
- In the event of Landing with Unsafe Gear Indications, after landing and coming to a stop, ensure canopy will open or that CFS will work prior to unstrapping. Structural damage may bind the canopy from normal opening. The CFS system may be required for escape but may also be rendered inoperable. Ejection is also an option on the ground.
- After landing with any unsafe indications, do not taxi or tow the aircraft until gear safety pins are installed.

LANDING

6. Landing Gear Emergency Extension

INDICATIONS

- Engine failure, abnormal hydraulic/electrical condition, or unsafe landing gear condition which warrants hydraulic system emergency operation.

ANALYSIS

- Situation warrants landing gear emergency extension.

ACTIONS

- Accomplish **Landing Gear Emergency Extension** Procedure (in Hydraulic Section of Checklist).

CONSIDERATIONS

- Activating the emergency landing gear extension system with normal hydraulic system indications and a ―non-electrical‖ gear malfunction (i.e. one gear fails to reach down and locked) could cause irreversible configuration other than all gear up or all gear down. Conference Hotel procedures should be activated prior to emergency extending the gear under these circumstances.
- The Emergency Landing Gear Handle button must be pushed in before pulling the handle.
- Landing gear and flap retraction is not possible once extended using the emergency landing gear extension system.
- Without intercom, pull the Emergency Landing Gear Handle in accordance with squadron standards. Ensure the front cockpit occupant knows how/when to use Emergency Landing Gear Handle in this case.
- Do not let additional red light in gear doors/gear handle indicators confuse actual landing gear positions – any combination of FCP/RCP gear indications that indicate all three green lights is the goal.
- AOA indexers illuminated or Landing/Taxi Lights illuminated also indicate three safe landing gear.
- If no three green are achieved after Emergency Landing Gear Handle extension, refer to checklist for **Landing With Gear Malfunction / Gear Retracted** Procedure (in Hydraulic Section of Checklist).

LANDING

7. Landing With Gear Malfunction / Gear Retracted

INDICATIONS

- A safe gear indication cannot be obtained and a gear up or partial gear down landing is required.

ANALYSIS

- The gear will not extend fully, or
- The nose gear will not extend, or
- The partially extended gear (other than two mains) cannot be retracted, or
- The partially extended gear (other than two mains) can be retracted.

ACTIONS

- Accomplish **Landing with Gear Retracted/Gear Malfunction** Procedure (in Hydraulic Section of Checklist).
- Be prepared to perform **Emergency Engine Shutdown On The Ground BOLDFACE** (in Engine Section of Checklist) when landing is assured. After the engine is shut down, you will lose nose wheel steering.
- Also be prepared to accomplish **Emergency Ground Egress** Procedure (in General Section of Checklist), as required.

CONSIDERATIONS

- The **Landing with Gear Retracted/Gear Malfunction** Procedure should be used anytime a normal configuration cannot be obtained; for one or more gear unsafe or for gear up landings.
- Have the Tower/RSU or a chase aircraft look the gear over. If the Tower or RSU inspects you, they can typically only tell the general condition of your gear and will probably not be able to determine if the gear are fully down and locked down.
- Preferred Landing Configurations (in order):
  1. Three Safe Gear.
  2. All Gear Up.
  3. Any Combination of Gear Down that includes at least one Main Gear.
  4. Only the Nose Gear Safely Down (if the only the nose gear is stuck down and cannot be retracted, consider ejection versus landing with this partial configuration).
- Put the drag in the center of the runway.
- If engine is not shut down until on the ground, anticipate a significant surge forward and an abrupt lowering of the nose due to the loss of drag and torque effect when the PCL is reduced to CUT-OFF.
- After landing and coming to a stop, accomplish **Emergency Ground Egress** Procedure (in General Section of Checklist), as required. Ensure canopy will open or that CFS will work prior to unstrapping and eliminating the ejection on the ground option. Structural damage may make the canopy difficult or impossible to open and render the CFS system inoperative.
- Communication will be impossible with the power off. A call to the other crewmember with expectations or directions may be necessary prior to battery and generator OFF. A brief radio call may help clarify the situation and expedite help from ground or tower.

LANDING

8. Landing With One Main Gear Up Or Unsafe

INDICATIONS

- Only one main gear indicates safely down and locked.

ANALYSIS

- One main gear is stuck up or not fully extended.

ACTIONS

- Accomplish **Landing with Gear Retracted/Gear Malfunction** Procedure (in Hydraulic Section of Checklist).
- Be prepared to perform **Emergency Engine Shutdown On The Ground BOLDFACE** (in Engine Section of Checklist) when landing is assured. After the engine is shut down, you will lose nose wheel steering.
- Also be prepared to accomplish **Emergency Ground Egress** Procedure (in General Section of Checklist), if required.

CONSIDERATIONS

- Have the Tower/RSU or a chase aircraft look the gear over. If the Tower or RSU inspects you, they can typically only tell the general condition of your gear and will probably not be able to determine if the gear are fully down and locked down.
- Preferred Landing Configurations (in order):
  (1) Three Safe Gear.
  (2) All Gear Up.
  (3) Any Combination of Gear Down that includes at least one Main Gear.
  (4) Only the Nose Gear Safely Down (if the only the nose gear is stuck down and cannot be retracted, consider ejection versus landing with this partial configuration).
- If engine is not shut down until on the ground, anticipate a significant surge forward and an abrupt lowering of the nose due to the loss of drag and torque effect when the PCL is reduced to CUT-OFF.
- Touchdown smoothly on the same side of the runway as the extended gear (i.e., put the drag in the center of the runway).
- Roll on the down and locked gear while holding the opposite wing up and the nose straight as long as possible.
- Use rudder and brakes as necessary to maintain a straight path down the runway.
- After landing and coming to a stop, accomplish **Emergency Ground Egress** Procedure (in General Section of Checklist), as required. Ensure canopy will open or that CFS will work prior to unstrapping and eliminating the ejection on the ground option. Structural damage may make the canopy difficult or impossible to open and render the CFS system inoperative.
- Communication will be impossible with the power off. A call to the other crewmember with expectations or directions may be necessary prior to battery and generator OFF. A brief radio call may help clarify the situation and expedite help from ground or tower.

LANDING

9. Landing With Nose Gear Up Or Unsafe And Both Main Gear Down

INDICATIONS

- Chase ship or tower/RSU has verified nose gear has failed to extend normally and main gear is down and locked.

ANALYSIS

- You are unable to fully extend nose gear.

ACTIONS

- Accomplish **Landing with Gear Retracted/Gear Malfunction** Procedure (in Hydraulic Section of Checklist).
- Be prepared to perform **Emergency Engine Shutdown On The Ground BOLDFACE** (in Engine Section of Checklist) when landing is assured.
- Be prepared to accomplish **Emergency Ground Egress** Procedure (in General Section of Checklist), as required.

CONSIDERATIONS

- Preferred Landing Configurations (in order):
  (1) Three Safe Gear.
  (2) All Gear Up.
  (3) Any Combination of Gear Down that includes at least one Main Gear.
  (4) Only the Nose Gear Safely Down (if the only the nose gear is stuck down and cannot be retracted, consider ejection versus landing with this partial configuration).
- Fly a normal approach.
- If engine is not shut down until on the ground, anticipate a significant surge forward and an abrupt lowering of the nose due to the loss of drag and torque effect when the PCL is reduced to CUT-OFF.
- Hold nose off runway for as long as possible.
- Gently lower nose to the runway prior to loss of elevator authority.
- After landing and coming to a stop, accomplish **Emergency Ground Egress** Procedure (in General Section of Checklist), as required. Ensure canopy will open or that CFS will work prior to unstrapping and eliminating the ejection on the ground option. Structural damage may make the canopy difficult or impossible to open and render the CFS system inoperative.
- Communication will be impossible with the power off. A call to the other crewmember with expectations or directions may be necessary prior to battery and generator OFF. A brief radio call may help clarify the situation and expedite help from ground or tower.

LANDING

10. Landing With Blown Main Tire

INDICATIONS

- Vibration and rough ride on takeoff or landing, or
- A ―pull‖ towards the failed tire during takeoff or touch and go, or
- Separating tread impacting the underside of the wing or flaps, or
- Tower or RSU or wingman advises, or
- Decreased performance on takeoff.

ANALYSIS

- Possible blown/flat tire and/or tread separation.

ACTIONS

- If still on the ground and sufficient runway remains, **ABORT.**
- If takeoff is continued, leave the gear and flaps extended (do not change flap setting) and have the Tower/RSU or another aircraft check the gear.
- If departing the prepared surface, perform **Emergency Engine Shutdown On The Ground BOLDFACE** (in Engine Section of Checklist). After the engine is shut down, you will lose nose wheel steering.
- Be prepared to accomplish **Emergency Ground Egress** Procedure (in General Section of Checklist), as required.

CONSIDERATIONS

- It may not be obvious that a main tire is blown until well into the landing roll due to lift on the wings at higher airspeeds.
- If a tire is blown while braking, the aircraft may drift away from the blown tire initially (as braking is less effective on that wheel).
- Consider reducing your fuel load before attempting to land.
- With a flat main gear tire, fly a straight-in and land on the side of the runway corresponding to the good tire (i.e., put the drag in the center of the runway). Use rudder, brakes and nose wheel steering for directional control.
- With tread separation, the brake line may have been severed. Have chase aircraft check the flaps for possible damage from separated tread. Land in the center of the runway because of the possibility of tire and (or) brake failure after touchdown.
- With a flat nose tire, consider trimming full nose down after touchdown to assist holding the nose tire off the runway. Land in the center of the runway and hold the nose wheel off the runway until just prior to losing elevator control.
- Do not taxi with a flat tire.
- After landing and coming to a stop, accomplish **Emergency Ground Egress** Procedure (in General Section of Checklist), as required. Ensure canopy will open or that CFS will work prior to unstrapping and eliminating the ejection on the ground option. Structural damage may make the canopy difficult or impossible to open and render the CFS system inoperative.

LANDING

11. Landing Without Brakes

INDICATIONS

- Toe brakes on rudder pedals offer no resistance when pressed.
- Brake fluid on boots or cockpit floor.
- RSU or another aircraft informed you fluid was leaking out of your brake lines.

ANALYSIS

- Brakes are inoperative on one or both main wheels.

ACTIONS

- If landing with known wheel brake failure on one wheel, land on the side of the runway corresponding to the failed brake (i.e., put the drag in the center of the runway). Use remaining brake and rudder/ailerons for directional control.
- If landing with known brake failure on both wheels, land in the center of the runway with a firm on-speed touchdown to dissipate energy. Use rudder/ailerons for directional control.
- If departing the prepared surface, perform **Emergency Engine Shutdown On The Ground BOLDFACE** (in Engine Section of Checklist). After the engine is shut down, you will lose nose wheel steering.
- Be prepared to accomplish **Emergency Ground Egress** Procedure (in General Section of Checklist), as required.

CONSIDERATIONS

- Use Landing Flaps for slower approach and landing speeds.
- If both cockpits are occupied, have both pilots try to brake (failure may be limited to one cockpit).
    - If discovered during landing roll, consider taking off to proceed to a longer runway or for another approach. Leave the gear extended and, if possible, have a chase ship look over your gear.
- Use nose wheel steering to aid in directional control, if necessary.
    - If the engine is shutdown on landing roll, you will have no way to steer the aircraft. Before engine shutdown, make sure the aircraft is pointed toward an uncongested area.
- After coming to a stop, if aircraft departed the prepared surface, accomplish **Emergency Ground Egress** Procedure (in General Section of Checklist), as required. Ensure canopy will open or that CFS will work prior to unstrapping and eliminating the ejection on the ground option. Structural damage may make the canopy difficult or impossible to open and render the CFS system inoperative.

MISCELLANEOUS

1. Crosswind Takeoff / Landings

CONSIDERATIONS

- Under crosswind conditions, the aircraft will tend to weather-vane into the wind. Weather-vaning can be controlled with rudder and aileron. Crosswind controls can be reduced as they become more effective as airspeed increases.
- Use up to full aileron deflection at the beginning of the takeoff roll. As speed increases, reduce aileron input to the amount required to keep wings level at liftoff. Use caution to prevent inducing an excessive wing low attitude at liftoff.
- If gusty winds are present, increase rotation, final approach and touchdown speeds by half the gust factor (up to 10 knots).
- Max crosswind for takeoff and landing is:
- **25** knots - Dry Runway.
- **20** knots - Touch and Go (per AFI 1 1-2-T6, Vol 3).
- **15** knots - Formation Takeoff and Landing.
- **15** knots - Solo Students (per AFI 1 1-2-T6, Vol 3).
- **10** knots - Max Recommended for Takeoff with Landing Flaps.
- **10** knots - Wet Runway.
- **5** knots - Icy Runway.
- RAP Technique for Crosswind Controls - Once on final, use rudder to align the fuselage of the aircraft with the runway, use aileron to roll into the wind to establish a ―wing-low‖ attitude to counter drift, and then add some power to compensate for the increased drag from the cross controls. Maintain control inputs through touchdown and landing roll out or touch and go.
- **There is no tailwind limit for landing. This may be a consideration in the event of an emergency to avoid populated terrain.**
- Calculating Crosswind: Both methods depend on first determining angular difference between runway and reported wind direction.
- **Clock Method** - Crosswind is a percentage of the reported wind relative to the percentage of minutes in an hour, dependent on the angular difference between the runway and reported wind direction.

Angular Difference Crosswind
15o off XW = 25% or 1/4 of the wind (as 15 minutes is 25% or 1/4 of an hour)
20o off XW = 1/3 of the wind (as 20 minutes is a third of an hour)
30o off XW = 50% or half of the wind (as 30 minutes is 50% or half of an hour)
40o off XW = 2/3 of the wind (as 40 minutes is 2/3 of an hour)
45o off XW = 75% or 3/4 of the wind (as 45 minutes is 75% or 3/4 of an hour)
≥ 60o off XW = 100% of the wind

- ***20% Method*** – Crosswind is a percentage of the reported wind, the percentage being 20 more than the angular difference between the runway and reported wind direction.

XW = [(Rwy Heading - Wind Direction) + 20]% x Wind Velocity

MISCELLANEOUS

2. Hot Brakes

INDICATIONS

- After landing or aborted takeoff during which maximum effort braking was used to stop the aircraft, or
- Notification from outside source that brakes are smoking, or
- Other situation in which overheated brakes are suspected.

ANALYSIS

- Excessive use exceeded the energy limits of the brakes have resulted in hot brakes.

ACTIONS

- Accomplish **Abort** Procedure (in Takeoff Section of Checklist).
- Do not taxi into or park in a congested area until the brakes have had sufficient time to cool. Your IFG will tell where to go for Hot Brakes at home field (normally at EOR).
- Do not set parking brake.
- Notify Ground Control and have Fire Crews respond.
- Point the nose of the aircraft into the wind, if possible.
- Do not allow anyone to approach from the sides, and only allow Fire Crews to approach. They should approach from the nose.
- Have the aircraft chocked, shutdown normally and egress toward the front or rear (not sides) to 300 feet.

CONSIDERATIONS

- According to the Brake Energy Limits / Maximum Braking Speed Chart (chart A3-2) in the Dash-1, application speed (the speed at which braking is initiated) has the greatest effect on brake energy.
- Applying brakes above 80 knots will lack the normal deceleration feedback and may result in skidding and blown tires and should only be accomplished with extreme care. Locked brakes, particularly at high speeds, are often very difficult to recognize.
- Airports that annotate Hot Brake Areas typically have surveyed this area to ensure the pavement is flat. Aircraft should normally not roll away once the engine is shutdown.

MISCELLANEOUS

3. Wake Turbulence

CONSIDERATIONS

- The T-6 is particularly susceptible to wake turbulence.
- Wake turbulence is most pronounced with calm surface winds.
- Crosswinds below 5 knots tend to hold the wingtip vortices in the vicinity of the runway.
- Crosswinds above 5 knots cause the vortices to move away from the runway and break up rapidly.
- Do not depend solely on a controller to advise you of the possibility of encountering wake turbulence. Remember, the controller may provide wake turbulence separation, which may not be adequate in all situations. It is your responsibility in each case to ensure proper separation on the approach.
- Be especially aware of the possibility of wake turbulence during takeoff, approach, and landing.
- Allow a minimum of 2 minutes before taking off behind any larger type aircraft or helicopter. Attempt to remain above and upwind of the preceding aircraft‘s flight path. To do this, take-off prior to the preceding aircraft‘s takeoff point and land beyond the preceding aircraft‘s nose wheel touchdown point.
- Allow a minimum of 2 minutes before landing behind any larger type aircraft or helicopter and a minimum of 3 minutes behind any aircraft designated as HEAVY in FLIP GP.

MISCELLANEOUS

4. Wet Runway Landings

CONSIDERATIONS

- Restriction - Maximum crosswind component for T-6 is **10 knots**.
- Hydroplaning can occur in water or slush as shallow as 0.1 inch.
- Although total hydroplaning in the T-6 occurs above 115 knots for the main gear and above 85knots for the nose gear, hydroplaning is a gradual process and partial hydroplaning occurs at airspeeds well below that required for total hydroplaning and will make skidding much more likely, particularly while braking or turning.
- Braking effectiveness at high speeds on a wet runway is approximately one third that for a dry runway (in slush, one fifth that for a dry runway).
- When landing on a wet runway:
- Plan a longer than normal landing roll - touchdown close to the approach end of the runway.
- Maintain directional control primarily with rudder - differential braking may be used to aid directional control at slower airspeeds.
- If skidding occurs, release brake pedal pressure while using rudder for directional control and smoothly reapply brake pedal pressure.

MISCELLANEOUS

5. Hard Landings

INDICATIONS

- Firmer or harder than normal/desired touchdown. Aircraft banging, strut compressing, blown tire(s), possible from resultant hard landing.

ANALYSIS

- Pilot was unsuccessful in arresting excessive sink during attempted round out/flare/touchdown.

ACTIONS

- If still on the runway or in overrun before go-around results in climb, it is usually best to stay on ground.
- If already airborne from go-around attempt, keep gear/flaps down and have chase ship check tire/strut condition and under wing structural condition.

CONSIDERATIONS

- Note G-meter indication.
- Ops limit calls for maximum rate of descent at touchdown to be 780 feet/minute(5.1Gs) for tires serviced at maximum landing condition pressure (225 +/- 5 psi) or 600 feet/minute (3.7Gs) when tires are at normal landing conditions pressure (185 +/- 5 psi). Any touchdown rate of descent exceeding this should probably be considered a hard landing. If this situation happens at night, at an out base, or with low ceilings, chase ship option will probably not be available. (Note: USAF Aircraft are serviced to 185+/- 5 psi.)
- May need to refer to **Landing With Gear Retracted / Gear Malfunction** Procedure (in Hydraulic Section of Checklist).

MISCELLANEOUS

6. Thunderstorm Penetration

CONSIDERATIONS

- There should be no reason to ever purposely penetrate a thunderstorm in a T-6.
- If penetrating a thunderstorm is unavoidable:
  - Ensure the probes anti-ice is on.
  - Ensure seat belt is tightened.
  - Lock shoulder harness reel.
  - Stow loose items.
  - Lower seat and avoid looking up from instrument panel to reduce blinding effects of lightning. At night, set instrument lighting to maximum intensity.
  - Fly recommended thunderstorm penetration speed of 180 KIAS. Do not exceed Turbulent Air Penetration Speed (Vg) of 195 KIAS. 180 KIAS will help prevent over-‗G'ing the aircraft. After trimming for 180 knots, do not change trim setting or chase the airspeed or altitude.
  - Use smooth and moderate aileron and elevator control to reestablish the desired attitude but do not make large or abrupt attitude changes to avoid and over G.
- If Windshear or Microburst accompanied with convective activity at the destination is reported -- Divert.
- If encountering a Windshear or Microburst— execute a go around/waveoff: If ground impact is imminent, consider immediate ejection.
- If Windshear or Microburst is in the forecast but NOT reported or suspected at the time of takeoff/approach:
  - Use Takeoff flaps but delay rotation to Vrot plus up to 10 knots.
  - If windshear is encountered near Vrot, abort if possible.
  - Once airborne, do not attempt to accelerate to higher than normal climb speed as the lower pitch attitude might produce a hazard if windshear is encountered.
  - Approach Precautions:
  - Set takeoff flaps and fly approach up to 10 knots faster than normal.
  - Stabilize approach prior to descending to 1,000 feet AGL.

MISCELLANEOUS

7. Icing Restrictions

CONSIDERATIONS

- Restriction - Sustained operations in known icing conditions are prohibited. The T-6 has been approved only for transit through a 5,000-foot band of light rime ice.
- When operating in areas of visible moisture, the probes anti-ice switch must be ON.
- Avoid flying in visible moisture at OATs at or below 5o C.
- Watch for ice accumulation near the bottom of the windscreen and leading edges of the wings.
- Anytime icing is encountered:
  - Aircraft should be climbed to sublimate or descended to melt the ice accumulation or changed in direction. Watch for freezing rain below the weather if descended.
  - Verify probes anti-ice switch is ON.
  - Set temperature controller to MANUAL and adjust temperature controller as necessary to avoid illumination of DUCT TEMP annunciator.
  - Set defog to ON and evaporator blower to HI.
- The weather forecaster may indicate that icing is either:
  - Forecast - projected to occur some time in the future.
  - Reported - has actually been encountered.
- Icing categories:
  - Rime - Rough, milky, opaque ice.
  - Clear - Glossy, clear or translucent ice.
  - Mixed - Combination of both.
- Icing accumulation intensities:
  - Trace
  - Light - Rime, Clear or Mixed.
  - Moderate - Rime, Clear or Mixed.
  - Severe - Rime, Clear or Mixed.

MISCELLANEOUS

8. Radio Failure (VMC)

INDICATIONS

- Unable to hear anyone on the radio.
- Receiving radio calls, but no replies to your transmissions.

ANALYSIS

- UHF/VHF transmitter/receiver failure (VMC).

ACTIONS

- Check circuit breakers, switch settings, and connections.
- Check the radio volume, personal leads, stuck mike and ICS KEY/MUTE Switch.
- If the RMU is still functioning, try the manual and guard frequencies, other radio frequencies, and try contacting another aircraft.
- Try the remote UHF
- Monitor VOR voice.
- Squawk 7600, if able.
- Local area - refer to IFG for procedures:
  - Fly to CAFB or another local suitable field, avoiding known training areas and routes.
  - Enter pattern via the appropriate VFR entry point.
  - Fly up initial at published pattern altitude.
  - Rock wings on initial.
  - Flash landing lights on final (if able)
  - Be alert for flares/lights from the tower.
- Outside the local area - refer to Flight Information Handbook:
  - Remain in VMC and fly VFR to a suitable landing field
  - Reference the Flight Information Handbook (FIH).

CONSIDERATIONS

- Ensure that neither the ICS KEY/MUTE button nor the UHF/VHF key are stuck - if ―TX‖ is displayed on the UHF/VHF display on the RMU, you have a stuck microphone and are transmitting on that frequency.
- For a stuck microphone, cycle circuit breaker:
- VHF COMM circuit breaker - FCP Generator Bus circuit breaker panel (right front console).
- UHF COMM circuit breaker - FCP Battery Bus circuit breaker panel (left front console).
- This is not a big deal as long as you remain calm and follow the IFG/FIH procedures.
- Be ready to go-around if a red light or flare is observed on final.

MISCELLANEOUS

9. Radio Failure (IMC)

INDICATIONS

- Unable to hear anyone on the radio.
- Receiving radio calls, but no replies to your transmissions.
- You are in the weather or cannot maintain VMC.

ANALYSIS

- UHF/VHF transmitter/receiver failure (IMC).

ACTIONS

- Check the weather around you and attain and maintain VFR if possible.
- Climb above the weather, if able.
- Check circuit breakers, switch settings, and connections.
- Check the radio volume, personal leads, stuck mike and ICS KEY/MUTE Switch.
  - If the RMU is still functioning, try the manual and guard frequencies, other radio frequencies, and try contacting another aircraft.
  - Try the remote UHF
  - Monitor VOR voice.
- Squawk 7600, if able.
- If established in a radar pattern (i.e., getting vectors to final), you are cleared any published approach.
- Local area - refer to IFG for procedures:
  - Fly the published recovery in the IFG.
  - Be alert for flares/lights from the tower.
- Outside the local area – refer to Flight Information Handbook:
  - Enroute - fly highest of Minimum enroute altitiude, Expected altitude, and Assigned altitude. Apply AVEF (Assigned, Vectored, Expected, Filed) to determine what route to fly.
  - Reference the Flight Information Handbook for other procedures (e.g., established in holding at fix before the IAF).

CONSIDERATIONS

- Ensure that neither the ICS KEY/MUTE button nor the UHF/VHF key are stuck - if ―TX‖ is displayed on the UHF/VHF display on the RMU, you have a stuck microphone and are transmitting on that frequency.
- For a stuck microphone, cycle circuit breaker:
- VHF COMM circuit breaker - FCP Generator Bus circuit breaker panel (right front console).
- UHF COMM circuit breaker - FCP Battery Bus circuit breaker panel (left front console).
- This is not a big deal as long as you remain calm and follow the IFG/FIH procedures.
- Be ready to go-around if a red light or flare is observed on final.

MISCELLANEOUS

10. Physiological Incidents

INDICATIONS

- Lightheaded, dizziness, or other hypoxia symptom, or
- G-LOC, or
- Sinus/Ear block, or
- Rapid Decompression.

ANALYSIS

- Physiological episode.

ACTIONS

- Advise other crewmember, refer to OBOGS system failure checklist.
- Descend to a cabin altitude less than 10,000 feet (if not experiencing a sinus or ear block).
- Gang-load the oxygen regulator (supply lever ON, concentration lever MAX, pressure lever Emergency).
- If symptoms do not go away, consider emergency oxygen (i.e., get on good oxygen).
- Declare an emergency with controlling agency.
- Land at closest suitable airfield with medical assistance.
- Land out of a straight-in approach.

After landing:

- Park as directed by ground crew.
- Accomplish AFTER LANDING and ENGINE SHUTDOWN checklists.
- Affected pilot(s) – do not disconnect ANY personal leads or restraints (mask may be dropped if breathing is difficult).
- Impound helmet for Life Support inspection.
- Affected pilot(s) – DNIF until cleared by a flight surgeon.
- Notify Wing Safety and Wing Life Support.

CONSIDERATIONS

- The pilot feeling the least effects should fly the aircraft.
- If incident is due to a sinus or ear block, level off or climb to relieve pressure and then perform a slow descent, clearing pressure as you go.
- If you suspect an oxygen system contamination, disconnect from the aircraft oxygen supply and use the emergency oxygen system.

MISCELLANEOUS

11. Lost Procedures

INDICATION

- You are unable to determine your location.

ANALYSIS

- You are lost.

ACTIONS

- Remain calm.
- Admit you are lost.
- Refer to IFG.

CONSIDERATIONS

- Tune in a local NAVAID.
- If you are lost in the T-6A with GPS working, you have done something dreadfully wrong..
- Use NAV Page 2 to determine your bearing and range from the nearest NAV-AID, or
- Use NAV Page 2 to display your Lat / Long and plot the coordinates on your VFR map, or
- Use the NRST function to find the nearest airport and attempt to fix your position from it.
- Use the 3 ―C‖s technique:
  - Climb - higher altitude will conserve fuel, increase radio range and in a VMC situation will give you a bigger picture of the area.
  - Conserve - fly a definite heading at L/D max airspeed (125 KIAS)
  - Confess - get radio assistance from ground agencies, if able. Use UHF/VHF and even GUARD if necessary. GPS OTH Page 2 displays the nearest ARTCC Frequency.
  - If unable to contact anyone squawk 7700.
- Land at any suitable airfield prior to running out of fuel.

MISCELLANEOUS

12. TOLD Definitions

CONSIDERATIONS

- TOLD considerations for the single-engine T-6 are much simpler than for multi-engine aircraft. For day- to-day operations, only a few numbers are of much relevance.
- **Takeoff Ground Run Distance** (i.e., Takeoff Roll) - That runway distance normally obtained in service operation at a given wind and gradient, at the mission-specified weight, pressure altitude, power setting, ambient temperature, and appropriate takeoff configuration.
- **Maximum Abort Speed -** The maximum speed at which an abort may be started and the aircraft stopped within the remaining runway length. Allowances are included for both a three-second decision period and a three-second period to accomplish the procedures. Speed may increase up to 20 knots during this six-second period. When the abort speed is above rotation speed, rotation speed becomes the max abort speed.
- **Minimum Power for Takeoff -** Figure A3-1 in the Dash-1 may be used to determine the minimum power at 60 KIAS. Takeoff in marginal conditions or when aircraft performance results in marginal takeoff or climbout capability should always be planned at charted power.
  Note: If a delay is encountered from when Minimum Power at 60 Knots is computed and actual takeoff, a new calculation must occur if IOAT increases.
  - **Landing Distance -** The sum of air distance and ground roll distance. Charts are based on the following assumptions:
  - A three degree approach to a 50-foot obstacle height.
  - Idle power and threshold speed as determined by the chart at 50 feet.
  - A two-second delay from touchdown to initiation of braking.
  - Maximum braking is obtained once the aircraft is firmly on the ground and continues to a full stop.
  - The braking friction for a dry asphalt or concrete runway corresponds to an RCR of 23.

MISCELLANEOUS

13. Lost Wingman / Breakout

INDICATIONS

- Breakout
  - You lose sight of lead.
  - Your presence in the formation constitutes a hazard to the formation.
  - Your flight path will carry you in front of or under lead.
  - You are told to breakout.
- Lost Wingman
  - Unable to maintain formation position in IMC conditions due to spatial disorientation or lost sight of lead.

ANALYSIS

- You need to gain immediate separation by executing lost wingman procedures (IMC) or breakout.

ACTIONS

- See AFMAN 11-248 for specific actions.

CONSIDERATIONS

- Initiate Lost Wingman or Breakout prior to any communication. Ensuring separation between aircraft is the top priority; communicating is secondary.
- If you lose sight anytime in VMC, call blind with an altitude. This will help lead to ensure vertical separation.
- Know the difference between lost wingman and breakout and when each applies.
- Lost Wingman Considerations:
- Immediately transition to instruments if in IMC.
- Be familiar with procedures prior to flying formation in IMC. When it happens, there is little time to think about the procedures.
- Lost wingman procedures do not guarantee obstacle clearance. Until a separate IFR clearance is obtained, you will be responsible for your own obstruction clearance.
- As lead, be ready to transmit your attitude, heading and altitude in the event of a lost wingman. He will need this information to ensure separation between aircraft.
- Breakout Considerations:
  When to breakout (common acronym is HITS):
  - When you are a **H**azard to the formation
  - When you are going to pass **I**n-front of or under lead.
  - When **T**old to.
  - When you lose **S**ight of lead.

See next page for diagram of various procedures

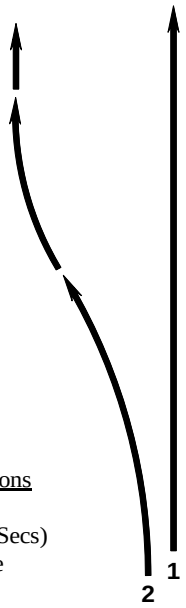
Lost Wingman Procedures

All Situations

Wingman Actions
- Simultaneously Executes Procedure while Transitioning to Instruments
- Notifies Lead

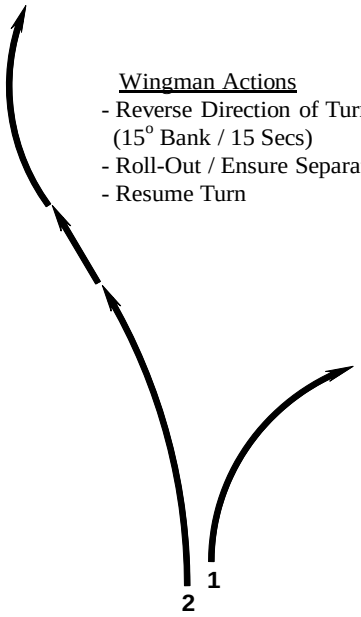
Lead Actions
- Should transmit Attitude and, as necessary, Heading, Altitude & Airspeed

Straight & Level



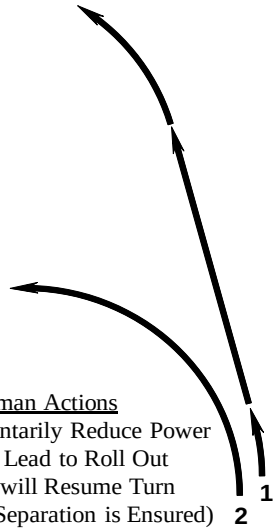
Wingman Actions
- Turn Away (15^{o} Bank / 15 Secs)
- Resume Course

Turns Away



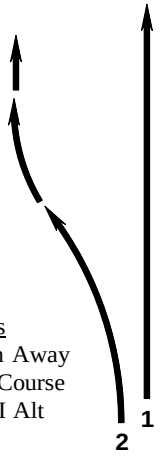
Wingman Actions
- Reverse Direction of Turn (15^{o} Bank / 15 Secs)
- Roll-Out / Ensure Separation
- Resume Turn

Turns Into



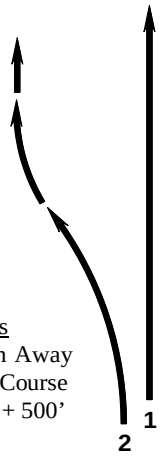
Wingman Actions
- Momentarily Reduce Power
- Direct Lead to Roll Out
- (Lead will Resume Turn when Separation is Ensured)

Instrument Final



Wingman Actions
- Momentarily Turn Away and then Resume Course
- Climb to FAF/GSI Alt

Missed Approach



Wingman Actions
- Momentarily Turn Away and then Resume Course
- Climb to MA Alt + 500'

#4 Additions

Wingman Actions

- Straight & Level
  -- Turn Away (30^{o} Bank / 30 Secs)
- Turns Away
  -- Reverse Direction (30^{o} Bank / 30 Secs)
- Turns Into
  -- Increase Bank by 15^{o}

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MISCELLANEOUS

14. Formation HEFOE Signals

CONSIDERATIONS

- Use when the radios do not work and you need to communicate a problem to the other aircraft in the formation.
- It is customary to offer the Lead to the aircraft that is having the difficulty three times; once when the HEFOE signal is passed, second when cleared for recovery, and finally once on final/High Key/Initial with the runway in sight.
- HEFOE – A basic game plan:
    (1) **H**ydraulic - RTB to a straight-in approach / Problem aircraft leads / Good aircraft low approaches.
    (2) **E**lectrical - RTB to a straight-in approach / Problem aircraft leads / Good aircraft low approaches (Good aircraft leads through IMC or for Instrument Approach until below weather).
    (3) **F**uel - Fly to Initial at nearest suitable field / Problem aircraft leads.
    (4) **O**xygen - RTB to a straight-in approach / Problem aircraft leads / Good aircraft low approaches.
    (5) **E**ngine - Fly to get on profile to High Key / Problem aircraft leads.
- The distressed aircraft indicates the signal. The good aircraft repeats it to ensure the pilots of both aircraft understand the nature of the problem.
- To avoid confusion, the HEFOE signals are usually exchanged between the Instructors in both aircraft.
- If you get a HEFOE signal, try to call the other aircrew on the radio. They may be excited about the EP and did not think to use the radio, or may be able to hear but unable to transmit. Also, try both radios (UHF/VHF).
- Listen to the prebrief carefully. You need to know what the distressed aircrew will be doing to recover the aircraft so you can coordinate. Refer to the Squadron T-6 Formation Standards for recovery options if briefed as ―standard.‖

MISCELLANEOUS

15. Birdstrike

INDICATIONS

- Bird(s) impact(s) aircraft and cause damage.

ANALYSIS

- Birdstrike damages aircraft, and/or bird(s) penetrate(s) the cockpit.

ACTIONS

- Power to MAX, level wings, get away from ground and other aircraft, if in formation.
- If bird penetrates canopy (relatively unlikely due to the relatively bird-proof T-6 windscreen), RCP Pilot should consider assuming control if FCP pilot appears incapacitated or injured. Determine which pilot (if dual) is best suited to fly - transfer of aircraft control may need to be done intercom out.

CONSIDERATIONS

- If birdstrike occurs during landing phase, consideration should be given to doing a full stop landing.
- For birdstrikes impacting the wing/tail area, a chase ship would probably be warranted - if already configured during the birdstrike, do not change configuration until chase ship can verify landing gear/flap condition.
- Severe wing damage could also lead to a fuel leak - monitor fuel quantity/balance.
- Accomplish **Controllability Check** Procedures (in General Section of Checklist) or **Flight With Shattered / Damaged Canopy** Procedures (in General Section of Checklist), as appropriate.
- Birdstrikes occurring at an out base or during night/IMC conditions will eliminate the chase ship option.
- On Low Levels, always climb if birds are in your flight path as birds will normally dive.

MISCELLANEOUS

16. Diversion

INDICATION

- You are unable to land at your intended destination due to weather or other conditions.

ANALYSIS

- Weather at intended destination is below minimums, or
- Runway at intended destination is closed, or
- Winds are out of limits, or
- Your aircraft dictates a diversion due to malfunction or fuel requirements, or
- You are directed to divert by someone such as the SOF.

ACTIONS

- Select a diversion airfield.
- Advise the controlling agency of your intentions and request clearance for a routing and altitude to either the field itself or a fix from which you can fly an instrument approach.
- Initiate climb to optimum altitude as soon as practical to minimize fuel used. If fuel is critical, do not wait for clearance to begin climb - clear; maintain VMC (if possible), declare an emergency, squawk 7700 and start climb immediately, if necessary.

CONSIDERATIONS

- For local sorties, the SOF will normally select the alternate airfield for you - information for these airfields is included in the IFG.
- Refer to the Alternate/Divert Airfields chart in the IFG for distance, fuel required, and time en-route to all of the available local alternates or the Diversion Range Summary Table in the checklist.
- Approach control will normally clear you for the most direct route to this base (e.g., GPS direct). You can also probably get radar vectors, if necessary. You should be very familiar with all the approaches that you may be required to fly at the divert base. If you have to divert for weather, chances are your original destination‘s weather is less than ideal. In this case, there may be several other aircraft diverting as well, so do not assume you will be number one for the instrument approach.
- You do not have to divert to your filed alternate. There may be other suitable fields much closer that may have weather better than or similar to the filed alternate. Other field‘s forecasts (or their lack of a weather forecasting capability) often precludes them from being the declared alternate.
- For off-station sorties, the GPS nearest function will help you quickly determine the closest ten airfields that meet the runway criteria you have selected. The runway should be hard-surfaced and 4,000 feet in length (shorter if absolutely necessary). Select NRST, pull out the right inner knob, and turn to cycle through them in order of nearest to furthest from present position.
- The GPS can continually identify the nearest field by selecting NRST, selecting the right cursor on and highlighting NR1 in upper right corner of display.
- Ensure the weather at the divert base is at or above the lowest minimums for the type of approach you can fly (VOR, PAR, ASR, ILS, localizer, GPS or visual).
- If possible, the field should have servicing facilities appropriate for the T-6A although your primary consideration is getting the aircraft on the ground safely.
- A close approximation of the fuel required for a no-wind 100 NM divert with climbing from normal pattern altitudes to 10,000 feet MSL for the following configurations:
  - Clean: 200# of fuel required for 100 NM divert.
  - Gear: 300# of fuel required for 100 NM divert.
  - Gear + TO Flaps: 350# of fuel required for 100 NM divert.
  - Gear + Ldg Flaps: 400# of fuel required for 100 NM divert.

MISCELLANEOUS

17. Chase Aircraft Procedures

CONSIDERATIONS

- If you are in the VFR pattern, climb to high pattern (not break-out altitude) and coordinate with the RSU Controller (or SOF in Randolph Tower-controlled pattern) for a chase aircraft. Clear aggressively as you climb/ descend through pattern altitude, particularly if you at less than 150 KIAS.
- If you are outside the pattern, request assistance in obtaining a chase ship with the controlling agency.
- Reference the IFG for chase/dissimilar chase aircraft procedures.
    1. Once you are talking to the chase ship, give them your flight parameters (i.e., location, altitude, airspeed, configuration, heading).
    2. After the chase ship has rejoined on you:
        - Inform the chase ship of any configuration or speed changes.
        - In addition to looking you over, the IP in the chase ship can read checklists, help you formulate a plan, and then monitor your recovery.
    3. Keep the chase ship for as long as you need them but, if you just need them to look you over, clear them off when they are finished. However, if you feel that you may need further assistance, keep them with you.
- If at all possible, get another T-6A to act as your chase ship. If a T-6A is not available, then use another type of aircraft but refer to the Chase Ship Procedures in the IFG.

MISCELLANEOUS

18. High Speed Dive Recovery

ACTIONS

- Procedure:
    1. PCL - IDLE
    2. Speed brake - EXTEND
    3. Maintain stick force to keep dive angle from increasing.

CONSIDERATIONS

- Avoid this situation by establishing a maximum airspeed above which you will not allow Students to pull inverted through the horizon (i.e., Split-S) (160 KIAS is commonly used).
- As a high-speed dive recovery may very likely result in significantly higher than normal G-forces, a good G-straining maneuver must be established as back pressure is initiated to avoid GLOC.
- 316 knots (VMO) or Mach 0.67 (MMO) are structural limiting speeds.
- Use 4G or 6G pullout. (See Altitude Loss charts in Chapter 6 of Dash 1).

T-6 EP DECISION GUIDE

This matrix is only a GUIDE, not a substitute for sound pilot judgment. This guide

HYDRAULICS	Emer	Nrst	St-in	ELP	Emer Gear	Stop on Rwy	Taxi Clr	Chase
EHYD PX LO	X		X				X	X
HYDR FL LO	X		X		X(12)	X		X
LANDING GEAR	**Emer**	**Nrst**	**St-in**	**ELP**	**Emer Gear**	**Stop on Rwy**	**Taxi Clr**	**Chase**
Blown Tire	X		X			X		X
Unsafe Gear Indication	X		X		X(1)	X(13)		X
ELECTRICAL	**Emer**	**Nrst**	**St-in**	**ELP**	**Emer Gear**	**Stop on Rwy**	**Taxi Clr**	**Chase**
GEN – Generator INOP	X						X(2)	
GEN BUS – Gen Bus INOP	X					X		
BAT BUS – Bat Bus INOP	X				X		X	
BUS TIE – Bus Tie INOP	X				X(3)		X	
Battery and Generator Fail	X				X	X		
Smoke/Fumes/Elec Fire	X	X			X(3)	X		
FUEL	**Emer**	**Nrst**	**St-in**	**ELP**	**Emer Gear**	**Stop on Rwy**	**Taxi Clr**	**Chase**
FUEL PX – Low Pressure	X(4)	X(5)		X(5)			X(9)	
FUEL BAL – Fuel Imbalance	X(10)		X				X	
OXYGEN	**Emer**	**Nrst**	**St-in**	**ELP**	**Emer Gear**	**Stop on Rwy**	**Taxi Clr**	**Chase**
OBOGS FAIL – Sys Malf	X						X(11)	
CKPT ALT – Ckpt	X(7)		X(7)				X(6)	
ENGINE	**Emer**	**Nrst**	**St-in**	**ELP**	**Emer Gear**	**Stop on Rwy**	**Taxi Clr**	**Chase**
Uncmnd Power	X	X		X	X(8)		X(9)	
Compressor Stall	X	X		X	X(8)		X(9)	
FIRE – Fire Warn in Flight	X	X		X	X(8)	X		
CHIP – Chip Detect Warn	X	X		X	X(8)	X		
OIL PX – Oil System Malf	X	X		X	X(8)	X		
Uncommanded Prop	X	X		X	X(8)		X(9)	
Engine Failure	X	X		X	X	X		
GENERAL	**Emer**	**Nrst**	**St-in**	**ELP**	**Emer Gear**	**Stop on Rwy**	**Taxi Clr**	**Chase**
CANOPY – Unlocked	X	X	X				X	
Runaway Trim	X		X				X	
Flaps (Asymmetric)	X		X				X	X
Gear/Flap Overspeed	X		X				X	X
Over-G	X		X				X	X
GLOC	X		X				X(6)	

(1) If called for by checklist
(2) Solo students may taxi clear if nose wheel steering operates
(3) If battery is unavailable
(4) Only if light remains illuminated – otherwise, early return
(5) If light remains illuminated
(6) Meet flight surgeon or qualified life support personnel
(7) Only if cockpit altitude exceeded 18K MSL – otherwise, early return
(8) Only if it becomes necessary to shut down the engine
(9) If malfunction is alleviated
(10) If unable to correct
(11) If hypoxia symptoms are present; meet flight surgeon
(12) As required
(13)Shut down engine before having gear pinned